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DEPARTMENT OF AGRICULTURE ANNUAL REPORT, 1951

PART I—AGRICULTURE IN 1951

Policy

So often in Africa one looks back over a period of sweat and toil and feels impatient and depressed by the absence of results or lack of evidence of progress. That 1951 in retrospect shows heartening evidence of progress is in no small measure due to the change in departmental organization which permits of two experienced Assistant Directors, one on the research side and one on the field extension and advisory side maintaining the closest contact with all officers of the department. These two appointments have led to a better co-ordination of effort, guidance to the inexperienced, the prevention of unnecessary duplication, decisions on the spot, encouragement so necessary for team work and improved relationships with the public and other departments of Government. Other factors which have helped to mark the year as one of progress are an improvement in the staff position, the continuance of remunerative prices and organized marketing and, particularly in the plantation industries, the availability of the necessary capital to effect improvements.

At the end of 1950 a Colonial Development and Welfare Fund grant was approved for the purpose of implementing plans for the improvement and extension of the Research and Specialist Services of the department. The three major items in the plan were the construction of new central research laboratories near Nairobi, the establishment of a Pasture Research branch of the department, and the provision of first order experimental stations in each of the four main agricultural provinces. For reasons beyond our control building of the new laboratories could not be started during the year. Plans for pasture research were revised following a visit by Dr. William Davies in October and, everything considered, reasonable progress was made in the development of the main station at Kitale and of the Marindas Station but major capital development was held up pending the Secretary of State's approval of the "virements" proposed by Dr. Davies. Three of the provincial experimental stations are in course of development but little investigational work could be started as suitably trained full-time officers were not available. A suitable site for the Nyanza station has not yet been obtained. Consequently, in the field of general husbandry, experimental work was chiefly undertaken by officers of the extension services on existing substations and was largely comprised of short-term experiments.

In the African areas a considerable increase in staff aided progress towards the objective of "sustained optimum yields". In the more climatically favoured zones, and particularly in areas of concentrated European advisory staff, progress towards real farming is evident. The pre-requisite of enclosure of land and paddocking is proceeding apace. In fact this movement is taking place much more quickly than our meagre resources can give guidance with the result that quite uneconomic holdings are being enclosed regardless of planned land use. Officers are making valiant efforts to cope by direct contact with farmers and by the training of African staff in the principles of land use and farm planning. Little progress can be reported towards a solution of the land tenure problems or in the provision of land titles with safeguards against the misuse of land or fragmentation. Particularly in the Central Province land is changing hands under various obscure customary procedures and the position becomes more complicated and difficult of solution every day. In these areas we have almost reached the stage where further agricultural advancement is impossible until the tangle of tenure and fragmentation problems is unravelled. Progressive farmers in these areas have, where necessary, and even on gently sloping land, voluntarily adopted

bench terracing as the permanent answer to soil wash. Particularly in Fort Hall district bush clearing and bracken eradication campaigns have met with much success and what was unused land has been converted into high quality grazing. What is now required is a more productive animal.

In Nyanza Province the policy of reward for good farming practices shows every promise of success. The three main criteria used are appropriate anti-erosion measures, the due proportion of land under rest and the use of properly prepared compost or farmyard manure. Rewards take the form of carts, wheel-barrows, implements, an increased price for maize and so on. Registers of approved farmers are kept in each district.

In Machakos district with the financial help and support of the African Land Utilization and Settlement Board the problem of rehabilitation is being tackled by the selection of a few pilot topographical areas where mechanical assistance is used to supplement human effort. A land use plan of the area is first prepared, the consent of the people is obtained and the pilot area virtually closed to cultivation and grazing during the operational period. In the first pilot area mechanical soil conservation measures have been completed and already the effects of closure and prevention of run-off are markedly beneficial in the return of a vegetative cover. This stage is comparatively easy but much patience and tact will be required in the next and subsequent phases which will entail boundary adjustments and the adoption of sound farming practices.

An innovation is the employment of a number of women African Instructors for advisory work in the Nyanza and Central Provinces. The numbers will be increased if the trial proves successful.

Cash crops, coffee, tea, pyrethrum, sisal, etc., have at the ruling high prices been in great demand by Africans. The need for high priced cash crops in achieving our object of a higher standard of living is recognized and the introduction of them is accepted policy. It is necessary, however, not to lose sight of our overriding obligation to ensure adequate supplies of food and it is in the African's own interests to restrict his cash crop area to that which he can afford after setting aside adequate land for the food requirements of himself and his family.

Reference has already been made to farm planning in the African areas. In the European areas some 26,000 acres in the Nakuru district alone have been planned and are now farmed on a sound mixed farming policy. In the same district some 35 additional names (involving some 30,000 acres) are on our books for attention. It requires a well-trained and experienced officer to accept the responsibility for this work and progress is geared to this limiting factor.

In both European and African areas progress towards the adoption of more sound farming practices is heartening. In the former areas there has been very noticeable capital expenditure of fencing and water supplies and much has been done to provide or improve water supplies in the African areas. The key to the rate of adoption of sound alternate husbandry is undoubtedly stock. In the African areas better bred and more economic animals are required to provide the necessary incentive. In the European areas the price of livestock products, particularly meat, must be brought into relationship, indeed favourable relationship, with prices for cereal products. Much of the land is understocked (certainly if more intensive mixed farming prevails) and the present stock population can multiply only too slowly. With improved meat prices the present wastage of bull calves might be eliminated and a desirable incentive given to beef production. Dual purpose breeds or the cross-bred animal might, with advantage, occupy a much more prominent place in the true mixed farming districts.

In the educational field steady progress can be recorded at our three training centres for African instructors, both in regard to the educational level of entrants and the usefulness of the finished product. Egerton College still has its growing pains, and facilities for lectures, practical training and sport must be greatly improved if the college is to achieve the hoped-for high reputation and standing. The output from the college could have been absorbed many times over in well-paid employment.

The department operates three dam construction units and in the European areas six mechanical soil conservation units. That both these services, often operating under trying and remote conditions, have maintained their reputation for efficient work is evidenced by the demand, which continues to exceed by far the capacity of the units.

Terracing for the sake of terracing or to enable a farmer to continue to grow wheat or maize for a few more years on worn-out land is not a palliative which the department willingly countenances. A system of farming, balanced as between cropping and livestock goes more than halfway to meet the requirements of soil conservation and the build-up of soil fertility. Where alternate husbandry is based on an economic and productive target, it is possible for the agriculturist and the conservationist to design the layout of a farm, including fencing, water supplies and roads, on conservation lines, dispensing with the necessity for a complete terracing system on the less steep lands. Sound farming therefore not only enhances the life and productivity of the soil but reduces the conservation bill, besides qualifying for priority of treatment.

The demand for research and technical services continues to increase. In the Highlands new areas are being developed and new problems encountered and appeals for assistance cannot be met. With the ever-increasing population pressure in the more favourable African areas concentrated attention should now be given to the discovery of techniques whereby the at present "marginal" lands can be made to carry their full complements of the overflow. To discover the answers we must have the tools. The extension and advisory services are now well staffed but their full effectiveness is geared to the output of the research and investigational services and for these services we require numbers of fully trained officers. The progress and development of Kenya depends on progressive and prosperous agriculture. The vital link in our agricultural progress is the provision of adequate technical staff, not only adequate in numbers but what is more important, adequately trained and equipped for the job they have to do, and if we are to obtain such staff Kenya must, to use a popular cry, pay a fair market price.

Weather

Rainfall for the year was well above average in all the main agricultural areas. Both the long and short rains were good, the latter everywhere persisting far into December. In general, the year was consequently very favourable for both annual and plantation crops, although excessively wet conditions reduced yields of some cereals, pulses, and potatoes in certain areas, especially those at high altitudes. The wheat harvest in particular, in localities at such elevations, was much interfered with, and in consequence farmers suffered extensive losses due to sprouting of grain in the ear.

(*The Director of Agriculture is indebted to the Director of the East African Meteorological Department for the following detailed notes on weather conditions and for Table A.*)

Rift.—Rainfall was well above average in March and April and October to December; the other months were below average, but the total for the year was 47 per cent above average.

West Rift.—January and February and June to September were below average, but rainfall was markedly in excess of average for the months of April, November and December; March, May and October were also above average, resulting in an annual total 23 per cent above average.

East Rift.—In January, February, June, July and September rainfall was below average, but the other months were above average, particularly during the "long" and "short" rains, and the annual total was 49 per cent above average.

Trans Nzoia.—In July and August rainfall did not vary markedly from average. January, February, May, June and September were drier than usual. The other months were well above average, and the total for the year was 27 per cent above average.

Nyanza.—In July and August conditions were drier than usual. For the other months of the year rainfall was above average, particularly in November and December, resulting in an annual total 37 per cent above average.

Main Coffee Areas.—January, February and September were drier than usual, but the "long" and "short" rains were markedly in excess of the normal rains and the yearly total was 59 per cent above average.

Coast Area.—In January, February, June, August, and September conditions were drier than normal, but falls above average were recorded in the other months and the annual total was 34 per cent above average.

Food Production in African Areas

Although 1951 is acknowledged to have been an outstandingly good year, the first six months suffered from the aftermath of the general failure of the 1950-51 short rains from the Coast to "East of Rift", following the partial failure of the previous long rains. Serious food shortage prevailed in the Ukamba districts of Machakos and Kitui, and to a lesser extent in Meru, Fort Hall and Kiambu, necessitating the importation to the Central Province for sale through established traders of 172,682 bags of maize and maize meal. In the Coast hinterland areas of the Kwale and Kilifi districts similar conditions required the importation for sale of 109,086 bags of maize and maize meal. The importance of drought-resistant cash crops, such as hedgerow sisal in Machakos and Kitui, castor seed in Kitui or cotton in coastal districts for placing the means to purchase food in the hands of sufferers, cannot be too highly stressed, as in 1951 no other financial assistance was necessary.

From mid-year all districts in the Colony and Protectorate became amply supplied with food and, besides selling surplus crops to Maize and Produce Control to a greater extent than for some years past, they entered 1952 with plentiful reserves from the good short rains.

While in the Coast and Nyanza Provinces the planting of anti-famine and anti-locust crop reserves in the form of cassava and sweet potatoes was maintained at the satisfactorily high level established in 1950, stocks of cassava in the ground in the Central Province were far from adequate to meet the locust threat, partly because stocks of planting material in Machakos, Kitui and lower Embu were at a low ebb at the onset of the main rains, and partly because African District Council resolutions to plant a minimum acreage of cassava were frequently ignored.

Of the other drought-resistant crops bulrush millet (*Pennisetum typhoideum*), after finger millet (*Eleusine coracana*) which is valuable in those parts of Nyanza where cassava cannot be grown, is a most valuable crop for native storage, not only in that Province but elsewhere, and yielded good crops with the long and short rains, amply replenishing the grain bins of the drier areas of the Central

TABLE A—RAINFALL OVER THE MAIN AGRICULTURAL AREAS OF KENYA, 1951

DISTRICTS AND NO. OF STATIONS	RIFT 20		WEST RIFT 11		EAST RIFT 19		TRANS NZOIA 21		NYANZA 23		MAIN COFFEE AREAS 26		COAST 15	
	Mean Fall 1951	Average Fall	Mean Fall 1951	Average Fall	Mean Fall 1951	Average Fall	Mean Fall 1951	Average Fall	Mean Fall 1951	Average Fall	Mean Fall 1951	Average Fall	Mean Fall 1951	Average Fall
	in.	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*
January	0·41	0·95	1·14	1·37	0·21	1·06	0·72	0·76	2·19	1·81	0·42	1·44	0·04	0·75
February	0·46	1·36	1·20	2·12	0·37	1·15	0·62	1·39	4·49	2·90	0·24	1·67	0·43	0·52
March	4·34	2·96	5·01	3·83	6·02	2·38	4·30	2·69	7·37	5·21	6·37	4·54	2·24	2·05
April	13·06	5·50	13·78	6·69	11·79	5·12	8·47	5·70	12·97	8·70	16·90	9·21	7·44	6·44
May	4·70	4·91	6·24	6·09	3·92	3·88	6·00	6·18	10·48	9·22	5·13	5·14	17·34	12·83
June	3·23	3·46	3·94	5·25	1·94	2·49	3·60	4·82	5·78	5·68	4·42	1·61	3·32	4·87
July	3·38	4·50	2·91	6·00	3·53	3·95	6·34	6·26	3·95	4·98	1·59	0·65	6·12	3·09
August	4·47	4·59	5·47	6·64	4·01	3·83	6·56	6·43	5·01	6·28	1·13	0·91	2·14	2·57
September ..	2·19	2·77	2·51	4·06	1·23	1·83	2·84	4·05	5·55	5·76	0·41	1·06	1·23	2·51
October	3·77	2·22	3·47	2·42	4·16	2·13	5·52	2·79	5·79	4·16	4·27	2·75	8·21	2·85
November ..	5·59	2·60	5·53	2·64	5·40	3·06	5·31	2·16	9·49	4·23	8·75	5·66	5·35	2·77
December ..	7·69	1·56	8·91	1·92	6·24	1·84	5·99	0·94	11·97	3·03	10·81	3·36	4·80	2·61
YEAR	53·29	37·38	60·11	49·03	48·82	32·72	56·27	44·17	85·04	61·96	60·46	38·00	58·66	43·86

Province. That other drought-resistant cereal, sorghum, despite stimulus from departmental staff in the field, continued to decline in popularity except in the Nyanza Province, a decline that was fostered in 1951 by the good yields of maize in areas marginal to that crop. In order to give greater stability to grain yields in areas of uncertain rainfall, trials are in progress with short-term maize and sorghum varieties in the Coast and Central Provinces. In so far as sorghum is concerned, adoption of proved dwarf varieties by the people can only be expected if they meet their requirements of palatability and immunity to insect damage in storage.

In the Nyanza Province, the present granary of the African areas, while no famine food supplies were required at any time, flooding or waterlogging caused partial crop failure or reduced yields in some places. The saleable surplus of food crops was likely to be further reduced because growers were encouraged to retain ample reserves, particularly of millets, cassava and sweet potatoes, against a possible invasion by locusts. The policy and aim of storing at railhead up to 50 per cent of surplus maize and produce keeps handy within the Province a strategic food reserve.

Agricultural Exports in 1951

The value of agricultural exports continued to increase, and reached the new record figure of £20,711,347, which was nearly 50 per cent greater than the last year's total, itself a record. Although in several instances there were increases in the quantities exported, the continued rise in prices of many products was the principal cause of the phenomenal increase in total value.

Exports of the following ten commodities exceeded £500,000 in value:—

	£
Sisal	6,948,160
Coffee	4,096,317
Tea	1,397,278
Wattle Extract	1,263,848
Cattle Hides	1,165,662
Cotton	986,478
Maize	666,850
Wheat	639,017
Goat and Kid Skins	609,578
Wheat Flour	515,377

The following table shows certain other agricultural export products in which there were notable increases in value:—

	1950	*1951*
	£	£
Meat of swine	157,418	253,660
Butter	156,403	202,318
Sunflower seed	89,634	147,797
Cotton seed oil	83,478	138,852
Castor seed	13,548	124,915

Table "B" gives fuller details of domestic exports from Kenya in 1951, while Table "C" gives comparative quantities and values of exports of Kenya produce for the years 1939 and 1949-51 inclusive.

TABLE B—DOMESTIC EXPORTS—KENYA, 1951

(Figures provided by the Commissioner of Customs and Excise)

Articles	Unit of Quantity	Quantity	Value
			£
LIVE ANIMALS, CHIEFLY FOR FOOD:—			
Bovine Cattle	No.	14	132
Sheep and Lambs	,,	31	55
Goats and Kids	,,	739	979
Other Animals (including Poultry)	,,	1,172	228
MEAT AND PREPARATIONS THEREOF:—			
Meat of Swine (Bacon, Hams and Pork)	Cwt.	25,545	253,660
Other Meat and Preparations Thereof	,,	9,033	68,086
DAIRY PRODUCTS, EGGS AND HONEY:—			
Milk and Cream, Fresh	Gallon	1,520	235
Milk (Dried Powder)	Cwt.	24	310
Cream (Evaporated or Condensed)	,,	45	849
Butter (Fresh or Salted) including Melted or Clarified	,,	12,698	202,318
Cheese	,,	222	3,045
Eggs, in the Shell	Dozen	75,988	9,240
Natural Honey	Cwt.	—	1
HIDES AND SKINS:—			
Hides of Cattle, Undressed: Sun-dried	Cwt.	10,653	208,025
Shade-dried	,,	43,890	957,637
Calf Skins and Kips: Sun-dried	,,	3	64
Shade-dried	,,	2	56
Sheep Skins and Lamb Skins:			
Sun-dried	,,	925	11,533
Shade-dried	,,	11,689	203,993
Goat Skins and Kid Skins:			
Sun-dried	,,	1,517	40,224
Shade-dried	,,	14,940	569,354
Other Hides and Skins	,,	* 10,787	165,171
SHEEP AND LAMBS' WOOL	Centals of 100 lb.	14,688	379,240
EDIBLE OILS AND FATS:—			
Lard, not including Neutral Lard	Cwt.	63	669
Other Animal Oils, Fats and Greases	,,	1,325	7,643
Cotton Seed Oil	,,	18,838	138,852
Other Edible Oils and Fats	,,	805	6,099
CEREALS:—			
Wheat	,,	427,232	639,017
Maize	,,	406,471	666,850
Millets	,,	24	28
Other Cereals	,,	763	878
MANUFACTURED PRODUCTS OF CEREALS PRINCIPALLY FOR HUMAN FOOD:—			
Meal and Flour of Wheat, Spelt and Meslin	,,	254,746	515,377
Maize Meal and Flour	,,	16,162	15,893
Meal and Flour of Other or Mixed Cereals	,,	3	7
Other Manufactured Products of Cereals	,,	294	1,138
EDIBLE NUTS EXCEPT OILNUTS:—			
Coconuts	Cwt.	28	23
Cashew Nuts	,,	1,443	22,349

* Includes, Wet Salted Hides, 8,618 cwt., valued at £110,431

Articles	Unit of Quantity	Quantity	Value
			£
Vegetables, Roots and Tubers, Chiefly used for Human Food and their Preparations, n.e.s.:—			
Potatoes, Fresh (not including Sweet Potatoes)	Cwt.	28,390	23,613
Other Vegetables, Fresh or Simply Prepared in Brine	,,	11,220	15,736
Beans and Peas	,,	39,609	70,935
Pulses	,,	16,234	35,054
Dhall	,,	2,977	10,403
Other Lentils and Legumes	,,	—	—
Sugar, Coffee, Tea, etc.:—			
Sugar, not Refined in Bulk	,,	1,024	2,412
Jaggery	,,	—	1
Coffee, not Roasted	,,	198,759	4,096,317
Tea	,,	82,452	1,397,278
Passion Fruit Juice	Imp. gal.	37,034	20,477
Oilseeds, Nuts and Kernels:—			
Groundnuts	Tons	—	—
Copra	,,	—	—
Soya Beans	,,	—	—
Cotton Seed	,,	—	—
Castor Seed	,,	1,345	124,915
Sunflower Seed	,,	3,225	147,797
Other Oilseeds, Nuts and Kernels	,,	43	1,320
Beeswax	Cwt.	399	10,144
Wattle Bark Extract	,,	444,462	1,263,848
Essential Vegetable Oils:—			
Geranium Oil	lb.	4,301	15,240
Other Essential Vegetable Oil	,,	154,700	23,249
Cotton Raw	Centals of 100 lb.	38,855	986,478
Flax	Tons	39	9,350
Sisal	,,	38,825	6,948,160
Mangrove Bark	,,	414	13,036
Wattle Bark	,,	2,109	48,064
Pyrethrum	Cwt.	26,473	357,123
Papain	,,	5	890

TABLE C—DOMESTIC E

Commodities	Unit	Quan 1939	1948	19
Animals Living:—				
Cattle	No.	—	—	
Sheep and Goats	,,	—	742	
Animal Products:—				
Bacon and Ham	Cwt.	1,376	4,391	
Beeswax	,,	1,208	638	
Butter, including Ghee	,,	21,277	18,739	1
Cheese	,,	652	814	
Hides (shade-dried)	,,	19,245	34,476	4
Skins (Sheep and Goats) shade-dried	No.	337,082	2,120,957	*2
Hides (sun-dried)	Cwt.	21,737	10,567	
Skins (Sheep and Goats) sun-dried	No.	1,014,543	829,181	*
Other Hides and Skins	Cwt.	—	—	
Wool	Centals of 100 lb.	15,114	8,940	1
Crop Produce:—				
Coco-nuts and Copra	Ton	215	31	
Coffee	Cwt.	338,125	287,644	15
Cotton	Centals of 100 lb.	59,677	9,056	2
Sisal	Ton	29,163	30,639	3
Flax	,,	16	56	
Beans and Peas (including Soya Beans)	Cwt.	123,002	40,548	
Maize	,,	1,007,125	272,152	6
Maize Meal and Flour	,,	112,029	125,416	4
Pulses Other than Beans	,,	7,756	85,887	2
Wheat	,,	973	128,125	14
Wheat Flour	,,	63,883	177,239	13
Grain Other than Maize and Wheat	,,	14,618	114,162	3
Groundnuts	Ton	402	65	
Linseed	,,	—	—	
Cashew Nuts	,,	32	69	
Sesame	,,	1,283	—	
Sunflower Seed	,,	477	828	
Coco-nut Oil	Imp. gal.	33,152	411	
Essential Oils	,,	3,660	4,100	
Groundnut Oil	,,	6,233	75	
Sesame Oil	,,	89,944	884	
Potatoes	Cwt.	173,046	33,762	4
Pyrethrum	,,	55,628	29,395	7
Sugar	,,	81,463	10,754	
Tea	,,	88,627	53,089	5
Wattle Bark	,,	226,716	229,560	11
Wattle Extract	,,	131,312	254,710	43
Passion Fruit Juice	Imp. gal.	22,744	29,432	2
Other Agricultural Produce	—	—	—	
Total				

*Unit –

TIES			VALUE				
9	1950	1951	1939	1948	1949	1950	1951
			£	£	£	£	£
	10	14	—	—	—	110	132
592	—	770	—	676	630	—	1,034
345	16,323	25,545	9,080	45,140	24,507	157,418	253,660
172	739	399	5,162	9,109	16,503	13,235	10,144
162	11,040	12,698	90,659	224,996	131,289	156,403	202,318
107	162	222	2,987	7,787	1,053	1,712	3,045
143	63,226	43,890	53,372	290,802	373,486	791,388	957,637
035	* 33,205	* 26,629	18,152	425,899	608,613	903,008	773,347
885	10,744	10,653	43,444	67,975	62,990	111,745	208,025
345	* 5,002	* 2,442	40,900	103,802	99,592	88,320	51,757
	—	10,787	—	—	—	—	165,171
267	11,865	14,688	56,578	91,714	94,619	208,661	379,240
25	8	1½	1,561	338	238	54	23
300	204,804	198,759	800,827	2,018,573	1,509,836	3,549,406	4,096,317
246	18,879	38,855	124,021	96,688	248,374	227,823	986,478
413	35,875	38,825	442,434	2,365,717	2,851,823	4,061,168	6,948,160
103	120	39	810	8,703	15,408	15,736	9,350
607	49,902	39,609	40,250	55,518	17,136	89,500	70,935
150	617,085	406,471	222,037	176,780	46,467	720,235	666,850
146	83,325	16,162	25,450	127,374	37,182	67,125	15,895
364	31,751	16,234	2,702	167,038	40,390	49,244	35,054
772	30,415	427,232	393	143,157	185,374	43,184	639,017
625	125,893	254,746	50,655	273,969	226,511	223,016	515,377
171	4,169	763	4,424	91,211	22,645	3,116	878
	—	—	4,442	2,060	4	17	—
625	581	1	5	—	34,999	32,499	56
46	140	73	1,812	13,549	10,396	22,381	22,349
	—	—	14,499	—	4	—	—
865	2,655	3,225	3,997	26,747	60,601	89,634	147,797
*20	—	—	2,346	103	404	—	—
460	*1,516	*1,420	4,956	7,270	18,890	34,540	38,489
157	*1	*2	680	24	660	8	12
*52	*31	*27	10,008	276	202	154	181
837	43,990	28,390	29,199	20,008	32,654	30,558	23,613
506	22,932	26,473	357,170	188,622	604,620	330,723	357,123
707	880	1,024	50,308	12,683	4,508	1,746	2,412
009	82,514	82,452	501,732	642,484	716,641	1,333,854	1,397,278
300	35,300	42,180	72,846	191,073	111,157	34,544	48,064
721	482,527	444,462	91,438	501,080	888,841	978,945	1,263,848
602	14,091	37,034	6,713	13,763	13,408	7,763	20,477
	—	—	54,446	370,690	523,239	371,265	409,951
		£	3,242,495	8,783,398	9,635,894	14,750,178	20,721,491

wt.

Crops

Barley.—The area under barley was estimated to be 24,768 acres, a considerable increase over the 19,353 acres sown in 1950. The larger area cultivated was mainly accounted for by the increased demand for malting barley and for pig feed. Production was 133,776 bags of 180 lb. compared with 114,585 bags in 1950. The 1951 average yield was thus 5.40 bags per acre, this low figure being due to the tendency to grow the crop on marginal land unprofitable for wheat.

Cashew Nuts.—The production of this crop was 792 tons of nuts, showing a good recovery from the figure of 555 tons for 1950. The crop was valued at £8,870; 72 tons of decorticated nuts, valued at £22,349, were exported. The price to the producer was 12 cents per lb. of nuts.

Cassava.—The increase in the area under cassava in Nyanza Province was maintained, approximately 74,000 acres being planted, compared with 71,000 in 1950. Production in the Province was 190,000 tons compared with 160,000 tons in the previous year. The crop was introduced into the cotton areas as a safeguard against locusts. In the Central Province efforts to stimulate increased planting were only partially successful. At the coast 300 acres of European cassava gave low results owing to disease. Resistant Amani varieties are being introduced into this area.

In Nyanza Province, 40,011 bags of 125 lb., valued at £15,000, were delivered to Control, as against 25,717 bags valued at £7,625, in 1950.

Castor Seed.—With the high price ruling for castor seed, Africans in Kitui district and the Coast Province planted increasing quantities of castor seed on field borders and as contour markers as well as picking from self-seeded plants. In all 4,944 bags of castor seed were marketed, valued at £22,445.

Chillies.—This is an important cash crop in the Teita Hills, Coast Province, where it is being grown in increasingly large quantities. Four thousand, three hundred and eighty-nine tons, valued at £24,582, were marketed, compared with 1,691 tons, valued at £9,470 in the previous year. The chillies are sold direct to local traders at about Sh. 1 per lb. but in 1951 an attempt was made to improve quality and to market direct to Mombasa through a local Co-operative Society. This was only partially successful, but about 300 bags were supplied at an average of Sh. 1.40 per lb.

Coffee.—1951 was an exceptionally good year for coffee, and non-native production rose to 9,760 tons, valued at £3,700,000, as against 6,335 tons, valued at £2,192,520 in the previous year. The average payment to growers was Sh. 374 per cwt. and the average yield per acre 3.25 cwt., a considerable improvement on the 2.1 cwt. of the previous year.

There were 8,208 licensed African coffee-growers, an increase of nearly 3,000 over 1950. The African coffee area was enlarged from 1,374 acres in 1950 to 1,735 acres in 1951. In Meru, the principal African coffee-growing district, 7 per cent of all families grow coffee. Coffee growing is just beginning in the Nyeri and Fort Hall districts. Meru district continued to produce coffee of exceptional quality. In 1951, 66.8 per cent were placed in the top three classes, and 78.8 per cent in the top four classes. The value of sales in the Central Province was £40,326.

In the Kisii Highlands of South Nyanza district by the end of 1951 1,470 growers had planted 370 acres of which 174 acres were in bearing. The ten primary societies working under one co-operative union were operating eight

pulping stations, with two more under construction. Continued planting around Mount Elgon raised the acreage of immature trees in North Nyanza to about 100, all such plantings being carefully supervised and, as in other districts, manuring and mulching being insisted upon. Sales from the 1950-51 crop in South Nyanza totalled 50 tons of parchment coffee and 21 tons of "buni" and 24 tons and 9 tons respectively had been sold of the 1950-51 crop to the end of the year. The value of sales in the calendar year 1951 was £14,538.

Copra.—With rare exceptions, hygiene in coconut plantations was severely neglected, resulting in damage from grass fires and the rhinoceros beetle. In general, the present main use for the palms is tapping for toddy. It is believed that their number in the Coast Province is decreasing, and a campaign has been started to restore the coconut population.

There was a further considerable drop in copra production from 1,182 tons, worth £43,973 in 1950, to 317 tons, valued at £15,780 in 1951.

Cotton.—As a result of the good 1950-51 season, production exceeded expectations, both in the Nyanza and Coast Provinces. The out-turn in Nyanza was 8,594 bales of 400 lb., and at the Coast 5,230 bales compared with 7,045 and 928 bales respectively in 1950. Forty-four cents and 15 cents per lb. for A.R. and B.R. grades respectively were paid to growers, compared with the corresponding prices of 30 cents and 11 cents in 1950.

In Nyanza Province a Cotton Research Officer began work on the improvement of cotton strains and cotton farming methods. Over a large area, the old impure B.P. 52 strain was successfully replaced by S. 47, from Uganda. The first introduction of U.K. 48 was made for eventual use in two zones.

A considerably increased acreage was planted at the Coast in 1951, but the crop, like that in Nyanza also, suffered from excessive rain. Buying started at the Coast in December at 49 and 17 cents per lb. for A and B grades respectively.

Essential Oils.—Exports declined slightly from 75.8 tons in 1950 to 71 tons in 1951. The value increased from £34,540 to £38,489. The quantity of geranium oil exported remained the same as in the previous year, at 38½ cwt. but the value rose from £10,317 to £15,240. There was renewed interest in Lumbwa area in the distillation of *Eucalyptus citriodora,* which was successful.

Flax.—Only 39 tons, valued at £9,350, were exported, compared with 120 tons, valued at £15,736, in the previous year.

Groundnuts.—In the Nyanza Province the main producing area, the acreage increased, but adverse weather conditions depressed yields. Total deliveries to Control decreased by 866 bags to 27,089 bags of 180 lb., of which Nyanza sales accounted for 22,562 bags, valued at £36,560.

Kapok.—There was again considerable increase in production—from 140,000 lb. valued at £2,450 in 1950, to 229,263 lb. valued at £9,170 in 1951. Growers received from 50 cents to just over Sh. 1 per lb.

Linseed.—The estimated area of 3,066 acres in 1951 was almost identical with that of the previous year, but estimated production fell by 1,376 bags of 200 lb. to 4,171 bags, giving the low yield of 1.36 bags per acre.

Maize.—At both the highest and lowest altitudes yields of maize were reduced by excessive rains. At intermediate altitudes yields were generally good.

The land under maize in the non-native areas showed an increase over the previous year of about 9,000 acres to 153,839 acres, but production was expected to show a reduction of 133,000 bags to 1,092,158 bags of 200 lb. giving an average yield of 7.09 against 7.74 bags per acre in the previous season.

Deliveries to Control were:—

	1949-50 *Bags*	*1950-51* *Bags*
Non-African areas	760,224	751,018
African areas	1,627,070	985,292

Oats.—In both Nyanza and Rift Valley Provinces there was a considerable increase in the cultivation of oats for hay and silage. Crops for grain suffered from excessive rain, with a consequent drop in yield.

The estimated area and production for the 1951 crop were 17,837 acres and 89,917 bags of 150 lb. respectively; the corresponding figures for 1950 being 15,255 acres and 94,840 bags, giving yields of 5.07 bags per acre for 1951, as against 6.93 for 1950.

Other Cereals.—The following quantities were bought by Control from African areas:—

	Bags (200 *lb.*)
Sorghum (*mtama*)	9,320
Millet (Finger)	28,244
Millet (Bulrush and Foxtail)	4,301

The overall reduction of about 35 per cent in sales was mainly due to a tendency by the growers, encouraged by Government, to retain a larger proportion of their foodstuffs against possible locust invasion which, fortunately, did not materialize.

Passion Fruit.—The area of passion fruit increased from approximately 400 acres in 1950 to 617 acres in 1951, and good crops generally were obtained. Production declined slightly to 24,669 gallons of juice. Local sales accounted for 1,462 gallons. Exports recovered to 37,034 gallons, valued at £20,477, compared with 14,091 gallons and £7,763 in 1950.

The factory to be established at Lumbwa in 1952 should help this small industry.

Potatoes.—Excessive rains reduced yields in the Nyanza Province and blight was prevalent, both in this and the Central Province. The variety "Dutch Robyjin" showed greater resistance than other varieties to the adverse conditions and to blight.

Sales of potatoes from the Central Province showed a further decline to 5,469 tons, valued at £58,065. One thousand four hundred and nineteen tons were exported compared with 2,200 tons in 1950, the respective values being £23,613 and £30,558.

Pulses.—Excessively wet conditions adversely affected yields of legumes in Nyanza Province and the higher parts of the Central Province. In the latter, however, losses in such situations were compensated by excellent crops in the lower, drier areas. The quantities of the principal pulses offered for sale were:—

	1949-50 *Tons*	*1950-51* *Tons*
Beans, various	4,073	3,861
Field peas	760	505
Cowpeas, grams and others	3,018	2,890

Sales of all kinds of pulses from the Central Province to Control and the fresh market amounted to 9,590 tons, valued at £257,056.

Pyrethrum.—Twenty-three thousand one hundred acres were licensed in 1951 compared with 22,000 in 1950. Production increased by 50 tons to 1,892 tons, but the number of growers declined from 521 to 468. The quantity exported increased by 177 tons to 1,324 tons, and its value from £330,723 to £357,123. There were under African-grown pyrethrum in the Central Province at the end of the year, 646 acres grown by 399 people, its distribution being 527 acres in Kiambu, 113 acres in Nyeri and 6 acres in Meru where 40 acres have been licensed by the Pyrethrum Board. Planting of the licensed acreage has not yet commenced in Embu and Fort Hall. For the whole of the Central Province 95,407 lb. of flowers, valued at £8,620, were sold compared with 56,773 lb. worth £2,861 in 1950. In South Nyanza, 120 acres of pyrethrum have been planted and sun-drying of flowers is at present practised. While in Nyeri co-operative driers have been constructed, in Kiambu there are 77 individual driers in use which are shared among the other growers when sun-drying is not possible.

Rice.—There was a further substantial increase in the area of transplanted, irrigated rice on the Kano plains of Nyanza Province, where there are now estimated to be 800 acres. In this region, the crop is becoming increasingly popular as a local food. The year was a very good one for rice at the Coast, where the acreage, both of swamp and irrigated rice, was greatly increased.

In Nyanza sales fell from 20,040 bags of 150 lb. in 1950 to 13,783 bags in 1951, valued at £18,643 and £13,498 respectively.

At the Coast, on the other hand, sales increased from 15,000 bags to 22,400 bags, worth £30,000 and £31,920 respectively.

Sisal.—The sisal industry again experienced a profitable year, which opened with the price of No. 1 sisal at £203 per ton c.i.f. United Kingdom, and closed at £213 after reaching a record figure of £256 in May. The average price obtained by producers for all grades was about £177 per ton.

The area under sisal was increased by 16,651 acres, much of which was recovered land replanted. The total area of sisal at the end of 1951 was 234,137 acres, of which 167,640 acres were mature. Mature areas cut in 1951 amounted to 108,950 acres, compared with 106,972 acres in 1950. Production in 1951 was 41,357 tons, against 39,831 tons in 1950.

Exports rose from 35,875 tons in 1950 to 38,825 tons in 1951, valued at £4,061,168 and £6,948,160 respectively.

The low quality of African grown, unwashed sisal fibre, extensive thefts from and illicit buying by estates, encouraged by the system of purchasing such fibre from Africans, led to its discontinuance from the end of the year. Licences granted to approved holders of registered marks for the purchase of sisal from Africans are now confined to leaf as distinct from fibre.

Sugar.—Weather conditions favoured sugar plantations in the Nyanza and Coast Provinces, and good yields of cane were obtained.

The area under sugar cane fell slightly—from 13,590 acres in 1950 to 13,425 acres in 1951. Thirteen thousand, seven hundred and twenty-four tons of refined sugar were produced, compared with 15,734 tons in 1950.

Sunflower.—There was a very considerable increase in both area and production of this crop in 1951. The estimated figures for the 1951-52 crop year were 25,685 acres and 145,326 bags (of 100 lb.) respectively compared with actual figures of 13,080 acres and 51,902 bags for the previous year. Exports for the 1951 calendar year were 3,225 tons, valued at £147,797, against 2,655 tons worth £89,634 for 1950.

Tea.—After an early setback from hail, the crop in the established areas was good. Planting in the new areas of Nandi and North Sotik progressed rapidly.

Wholesale and retail prices in Kenya and Uganda were increased by an average of about Sh. 1 per lb. resulting in uniformity of price in the above two countries and Tanganyika Territory.

The total planted area at the end of 1951 was 19,873 acres compared with 18,676 acres a year earlier. Production at 15,326,008 lb. in 1951 showed a further increase over the previous year's record of 14,938,441 lb. Local consumption rose by 740,000 lb. to 4,880,964 lb. in 1951.

Exports were 9,234,624 lb. valued at £1,397,278 in 1951, against 9,271,568 lb. valued at £1,333,854 in 1950.

Tobacco.—Drought reduced yields of the first flue-cured crop, and excessive rain reduced the quality of the second crop to some extent. A new area in the Embu district was opened up for which barns were built by the East African Tobacco Company. Both yield and quality in this new area were good, and prospects there are considered bright.

The East African Tobacco Company bought 1,334,342 lb. of green leaf valued at £3,119, compared with 1,729,169 lb. worth £3,928, in the previous year.

Excessive rain adversely affected the native-cured tobacco crop in the Central Province. Much of the crop was sold to itinerant traders, so that a complete check on sales is not possible. Recorded sales, however, showed a decline in quantity from 874,976 lb. in 1950 to 523,194 lb. in 1951, with corresponding values of £32,900 and £24,707.

Growers in the Lamu district of the Coast Province experienced difficulty in selling their crop as, with the handing back of Somalia to the Italian Government, the market previously existing in that territory under British administration was closed. Although tobacco was extensively grown in small patches throughout the Province, much of it was disposed of in local trading, of which there are no accurate statistics.

Vegetables, Fruit and Flowers.—In Nyanza the high prices of other crops militated against the production of vegetables for sale for the European and Asian markets. Sustained production, moreover, usually requires irrigation, which is not often available. Little good fruit is grown in the Province, but efforts are now being made to improve the position by the propagation of good oranges for distribution.

In the Central Province the area of African-grown pine-apples further increased, and is now estimated at over 1,000 acres. In consequence, production has overtaken the local fresh fruit demand, and sales to a cannery began early in the year. Four hundred and seventy tons were thus sold at £12 10*s.* per ton at the factory.

It was a good year for fruit and vegetables, and the flower trade in the Kiambu district continued to thrive. Bananas were particularly plentiful and sales, mainly for consumption by urban Africans, were three times as great as in 1950. Recorded sales of fruit and vegetables in the Province were:—

	£
Bananas	62,795
Pine-apples	5,875
Other kinds	76,404

In the Coast Province the main source of vegetables is those grown by Africans in the Teita Hills, where the chief kinds produced are cabbage and green beans, which are sold through co-operative societies.

There are 40 acres of irrigated fruit on a European estate at Taveta, where excellent citrus, as well as guavas and tomatoes are produced. Other Europeans have been buying citrus and mango seedlings from Matuga Agricultural Station. There has been continual expansion in pine-apple cultivation near the new canning factory at Kilifi, where two estates now have about 50 acres each under this crop.

About £123,500 were realized for fruit and vegetables in the Coast Province.

Wattle.—There was a steady increase in wattle-planting in the African areas of Kericho district and in South Nyanza. In the Rift Valley Province, which is the main European wattle-growing area, there are now 51,052 acres, of which about 90 per cent are in the Uasin Gishu district.

In the Central Province the price of undergrade bark was so high that growers often did not trouble to sort out the F.A.Q. grade.

The following table gives statistics of purchases of bark and exports of extract:—

	1950	*1951*
Bark Bought—		
African Areas—		
Central Province	35,627 tons	29,395 tons
Total, African Areas	43,080 tons	33,641 tons
European Areas		
Total	12,321 tons	11,767 tons
Total Value (African and European areas)	£364,270	£381,936
Extract Exported	24,126 tons	22,223 tons
Value	£978,945	£1,263,848

Wheat.—In Nyanza Province there was an increase in African-grown wheat in Kericho district. The crop is being introduced into North Nyanza district.

In the European areas of the Rift Valley Province the wheat area was increased by 35.000 acres to 298,000 acres, the increase being mainly on the Kinangop Plateau. Excessive late rains disastrously affected the harvest, especially in the Trans Nzoia district, where the crop, estimated in October at 80,000 bags of millable wheat, was reduced to 30,000 bags by the end of the year. In consequence the yield per acre was estimated to have dropped from 5.37 bags in the previous year to 4.77 bags (200 lb.) per acre. Production, estimated at 1,427,706 bags, is almost the same as for the 1950-51 crop. Twenty-one thousand three hundred and sixty-two tons, worth £639,017, were exported in 1951, compared with 1,521 tons, valued at £43,184 in the previous year.

Livestock Produce

Bacon and Lard.—As shown in the following table, there was an increase in deliveries to the factories of all classes of pigs:—

	1950	*1951*
Baconers	37,465	43,264
Porkers	14,166	14,641
Larders	4,663	5,089
Total	56,294	62,994

There was a further considerable rise in exports of bacon, ham and pork from 16,323 cwt. worth £157,418 in 1950, to 25,545 cwt. valued at £253,660 in 1951.

Butter.—Creamery production increased by about 20 per cent to 7,537,136 lb. Six million, two hundred and fifty-five thousand, six hundred and twenty-five lb. were consumed locally and 12,698 cwt. worth £202,318, an increase in value of nearly 30 per cent over 1950, were exported. The average pay-out for Grade I butter-fat was Sh. 2/54 per lb.

Cheese.—All figures showed a large increase over those of the previous year. The total creameries' production was 580,650 lb., and 24,864 lb. valued at £3,045 were exported.

Clarified Butter.—There was a further small increase in African production, while non-African was more than doubled. Comparative figures of production, the total value of which in 1951 was £42,673, are as follows:—

	1950	*1951*
African	846,180	850,248
Non-African	27,234	60,338
Total	873,414	910,586

Eggs.—There was a further decline in the sales of eggs. Fifty-seven thousand, four hundred and ninety-three gross, valued at £40,559, were sold from the Nyanza and Central Provinces compared with 66,269 gross, worth £46,521 in 1950. Six thousand, three hundred and thirty-two gross compared with 5,629 gross in the previous year, were exported, the respective values being £9,240 and £6,993.

Poultry.—Sales made a partial recovery, 231,394 head being disposed of, compared with 196,354 in 1950.

Hides and Skins.—At 94,406 cwt. the total exports showed a decrease of 22,870 cwt. compared with 1950, but the value increased by £217,151 to £2,156,057. Details of exports are as follows:—

	Cwt.	*Value* £
Cattle hides (shade-dried)	43,890	957,637
Cattle hides (sun-dried)	10,653	208,025
Calf skins and kips (shade-dried) ..	2	56
Calf skins and kips (sun-dried)	3	64
Sheepskins and lambskins (shade-dried)	11,689	203,993
Sheepskins and lambskins (sun-dried) ..	925	11,533
Goatskins and kid skins (shade-dried) ..	14,940	569,354
Goatskins and kid skins (sun-dried) ..	1,517	40,224
Other hides and skins	10,787	165,171

Slaughter Stock.—The following are comparative figures of purchases by the Meat Commission:—

	1950	*1951*
European-owned cattle and calves	30,308	39,255
African cattle	23,930	13,145
European-owned sheep and goats	23,827	20,266
African sheep and goats	82,939	69,081

Wool.—The value of wool exports again increased greatly. Fourteen thousand, six hundred and eighty-eight centals (100 lb.) valued at £379,240 were exported, compared with 11,865 centals, valued at £208,661 in the previous year.

TABLE D.—QUANTITIES AND VALUES OF MORE IMPORTANT PRODUCTS MARKETED (PARTLY ESTIMATED)

Produce	Unit	Nyanza Province		Central Province		Coast Province	
		Quantity	Value	Quantity	Value	Quantity	Value
			£		£		£
Beeswax	36 lb.	—	—	1,536	9,329	—	—
Cashew Nuts	Cwt.	—	—	—	—	15,839	8,870
Cassava	125 lb.	40,011	15,002	—	—	8,422	5,264
Chillies	Cwt.	—	—	—	—	4,389	24,582
Coffee (Parchment)	,,	992	14,538	1,178	22,590	—	—
Coffee (Buni)	,,	407		2,883	17,736	—	—
Copra	Tons	—	—	—	—	317	15,780
Coriander	180 lb.	—	—	1,809		—	—
Castor Seed	,,	—	—	4,475	24,207	—	—
Cotton (Seed Cotton)	100 lb.	116,032	243,062	—	—	69,233	142,400
Cotton (Lint)	400 lb.	8,594		—	—	5,230	
Eggs	Gross	25,187	16,371	32,306	24,188	—	—
Fuel, Poles and Charcoal	—	—	—	—	66,230	—	—
Ghee	36 lb.	23,618	42,366	81	307	—	—
Groundnuts	180 lb.	22,648	36,560	—	—	—	—
Hides	36 lb.	81,729*	—	21,959	112,770	—	—
Kapok	36 lb.	—	—	—	—	6,368	9,170
Maize and Maizemeal	200 lb.	959,100	642,583	101,654	121,824	26,800	27,400
Millet and Sorghum	200 lb.	37,553	30,215	755	873	—	—
Miraa (*Catha edulis*)	Tons	—	—	11,700	8,776	—	—
Potatoes	180 lb.	4,816	3,359	68,069	58,065	—	—
Poultry	Head	13,772	—	217,622	27,977	—	—
Pulses	200 lb.	8,377	12,442	119,344	257,056	17,040	35,400
Pyrethrum	lb.	—	—	95,407	8,620	—	—
Rice (Paddy)	150 lb.	13,783	13,498	—	—	22,400	31,920
Sesame	180 lb.	236	381	—	—	600	1,200
Sisal Leaf	Tons	—	—	14,992	37,625	—	—
Sisal Fibre	,,	1,500	112,500	2,464	193,679	—	—
Skins	Score	2,369	—	28,733	125,652	—	—
Tobacco, Green Leaf	lb.	—	—	1,334,342	3,119	—	—
Tobacco, Native Cured	,,	—	—	523,194	24,707	35,840	1,792
Vegetables, Flowers and Fruit, including Bananas	Tons	—	—	15,921	148,264	8,570	123,500
Wattle Bark	,,	—	—	29,395	381,936	—	—
Wheat	200 lb.	1,792	3,037	124	219	—	—

* Number.

PART II—RESEARCH AND SPECIALIST SERVICES

At the end of 1950 a Colonial Development and Welfare Fund grant was approved for the purpose of implementing plans for the improvement and extension of the Research and Specialist Services of the Department. Apart from extensions to the Coffee and Horticultural Research Sections, the main features of this plan were the construction of new central laboratories for the specialist officers in Nairobi to replace the extremely unsatisfactory existing accommodation, the establishment of a Pasture Research Organization to serve the three most important ecological zones of the Colony, and the provision of experimental stations, staffed with officers whose duties would be confined to experimental work in all four Provinces. Progress in implementing these plans has been slow. It was not found possible to begin building the new central laboratories during the year. The Pasture Research Plan was revised in the light of recommendations made by Dr. William Davies, who visited the Colony in October, 1951, and although a start has been made on the development of two of the three stations they are still far from complete. Three of the provincial experimental stations are in course of development but no full time experimentalist was available for any of them and little or no investigational work could be started on them during the year. A suitable site for the fourth station, in Nyanza Province, has not yet been found. Consequently, in the field of general husbandry, experimental work has chiefly been undertaken by field officers on existing sub-stations and has largely comprised short-term experiments with a preponderance of crop variety trials.

Plant Pathology

Wheat stem rust identification tests carried out on material from the 1950 crop showed that strains K.9 and K.1 were the most common and revealed the presence of two apparently new forms, K.10 and K.11. Strain K.10 follows the same reactions as K.5, except that those on Kenya Governor and Einkorn are reversed.

The most important disease of wheat was "Take-All" (*Ophiobolus graminis*). The increased number of reports of this disease was considered to be due to a flare-up of existing foci during the exceptionally wet growing season rather than to any general extension of the disease. Continuous wheat growing on the same land is a major factor in the survival of the disease which is aggravated by the ploughing in of stubble. The possibility of varietal differences in susceptibility is being investigated.

Potato and tomato blight (*Phytopthora infestans*), was exceptionally severe throughout the Highlands. Many crops of susceptible potato varieties at higher altitudes were a total loss and few tomato crops grown in the rains produced any return. The widespread attack by *P. infestans* on perennial wild *Solanums,* has apparently resulted in the appearance of two new biotypes of the fungus. G. and H., and with their appearance the hitherto immune hybrids, obtained from Dr. Black, were all attacked to a greater or lesser extent. Nevertheless, they proved greatly superior in performance to the non-resistant varieties still in cultivation. Dr. Black's hybrids immune to biotypes A and C have now been largely discarded. A later introduction, 1512 d 4, immune to biotypes A. B. C. E. F. shows much promise.

Observations and studies were continued on the fungus *Ramularia bellunensis,* cause of pyrethrum bud disease. A good deal of information has been accumulated on the mycological aspects and conditions affecting the incidence of the disease and the nature of its spread. Toxicity to the fungus of a number of modern fungicides has been assessed in the laboratory and studies made of the behaviour of the fungus in culture. Field trials with Tulisan and Perenox-oil have been continued.

Entomology

Further statistical experiments have been conducted on the protection of stored grain with various materials. B.H.C. again proved an effective insecticide and pyrethrum again gave variable results which will require further investigation. It seems that the effectiveness of pyrethrum is related to atmospheric relative humidity and to the moisture content of the grain and is also affected by the presence of insects parasitic on the grain weevils. Pyrethrum has been found to be more effective at high humidity than under dry conditions but in the presence of parasites its efficacy as a grain protector may be reduced because it has a greater killing effect on the parasites than on the weevils.

Scoliid wasps were introduced from Mauritius for the biological control of chafer grubs (*Schizonycha* spp.) which are important pests, particularly in the Trans Nzoia. Several liberations have been made but recoveries may not be made for several years and even if the introduction is successful a high degree of control is not probable. Laboratory tests have indicated that the application of certain insecticides to the soil is effective against these grubs and field trials will be undertaken in 1952.

The use of a number of insecticides, as soil or seed dressings, was tested experimentally in the field against beetles damaging cereal seedlings, the most important pest being *Heteronychus consimilis*. Two treatments, Mergamma A as a seed dressing and Aldrin applied to the soil, were outstandingly effective.

A heavy infestation of a species of *Epilachna* again occurred in parts of the Rift Valley, damage being done to oats, barley, maize and potatoes. Laboratory tests have shown that D.D.T., B.H.C. and Parathion give effective kills and these insecticides will be tried in the field in 1952.

Mass breeding and large-scale liberations of the ladybird *Hyperaspis jocosa*, parasitic on the Jacaranda Bug (*Orthezia insignis*), have been carried out and the indications are that a measure of control of the latter is being obtained. Arrangements have been made for the introduction of other natural enemies of *Orthezia* from Trinidad, where the Commonwealth Institute of Biological Control is collecting them.

Following upon the work of Way, in Zanzibar, a preliminary investigation on the Kenya coast showed that coconut yields there are also being reduced by the action of a *Theraptus* sp. but that it is not the same species as that primarily concerned in Zanzibar.

Soil and Agricultural Chemistry

Pot-culture trials reported in the 1950 annual report confirmed observations made in previous years that sodaphosphate is at least as effective for certain young gramineous seedlings as an equivalent quantity of superphosphate, when these fertilizers are used diluted with soil: however, a high concentration of sodaphosphate in the fertilized zone was found to depress phosphate uptake from this fertilizer and on this basis an explanation of the reputed inferiority of sodaphosphate in relation to superphosphate was suggested. This year a microplot field trial failed fully to confirm these results. The mean dry weight of wheat seedlings did not differ significantly between plots receiving superphosphate and sodaphosphate but there was an indication that the plant is slightly less able to take up phosphate ions from sodaphosphate than from superphosphate. Furthermore, in direct contrast to anticipation, dilution with soil in the fertilized zone was found somewhat more effective in increasing the effectiveness of superphosphate on plant growth than it was for sodaphosphate.

A pot-culture trial was made to examine the response of young cereal seedlings, grown in acid vlei soils from Ol Joro Orok, to three levels (nil, low and high) of soda-phosphate and superphosphate, with and without ground limestone.

The outstanding result obtained was that the addition of lime caused stunting of growth, low dry weight yields and the development of marked symptoms of phosphate deficiency. In another pot-culture trial Seychelles phosphate (Seychelles guano) of three grades of fineness was compared with superphosphate at four levels of application, using sand and three types of soil. Phosphate uptake from superphosphate was better than from the two lower grades of guano but not from the finest grade. Soil type had little effect on the efficiency of phosphate uptake from the different fertilizers and on all soils dry matter yields showed no response to phosphate application.

Further sampling of the trial started in October, 1948, to study the residual effects of heavy dressings of Uganda Rock Phosphate, sodaphosphate, and superphosphate on Rhodes grass, revealed phosphate responses much greater than those reported in 1950 and as great as those recorded in the first sampling after applying the fertilizers. The explanation of the low residual effects recorded in 1949 and 1950 may rest in the low rainfall experienced in those years.

In view of the increasing use of lupins for green manure and fodder, and the known variation in alkaloid content of the types grown, an investigation was undertaken in collaboration with the Veterinary Department, aiming at determining safe toxicity limits for lupin feeding. Lupin plants cut as late as full flowering and having as high an alkaloid content as 0.3 per cent on dry matter were found not to produce lupinosis symptoms in sheep. The trial indicated that most forms of sweet lupin are safe feeds provided they are cut before setting seed: caution is needed in feeding the seeds, or plants on which seed has set.

Plant Breeding and Selection

Plant breeding and the trial of introduced varieties of a number of crop plants is carried out at the Plant Breeding Station, Njoro (7,100 ft.) and at substations at Molo (9,300 ft.), Ol Joro Orok (7,800 ft.), Rongai (6,000 ft.), Kitale (6,000 ft.) and at the Scott Agricultural Laboratories (5,700 ft.).

Wheat.—Estimates show that during the season over 70 per cent of the acreage under wheat in Kenya and nearly 95 per cent of that in the Northern Province of Tanganyika were sown to varieties produced by the station. The remainder is mostly accounted for by introductions made by the Department and released to farmers after test. Little disease was in evidence in Kenya but serious stem rust attack greatly reduced the crop in the Northern Province of Tanganyika.

Two new physiological forms of black stem rust, *Puccinia graminis tritici*, K.10 and K.11, appeared during the season. Cross 294, at present the most popular variety in the Colony, shows susceptibility to K.10. 318.AJ, second in order of importance, is resistant to K.11. Tests are still continuing.

Two new wheats were released to farmers from Departmental control and a further number are still under trial and multiplication. A large number of new introductions were under test, many new crosses were made and fixed hybrids were promoted to the yield trials at Njoro, Rongai, Ol Joro Orok and Molo. The aim at Rongai is the production of stem and leaf rust resistant varieties suited to hotter and shorter season conditions; at the other two stations varieties for cooler and longer season climates are required which must also possess resistance to yellow ear rust. *Puccinia glumarum.* Pelshenke wholemeal fermentation tests were carried out on new hybrids and samples of fixed hybrids were sent for baking quality tests to the Nairobi Laboratory of Messrs. Unga, Limited.

Barley.—The wet season has suited the barley crop and some excellent, plump and mealy samples were received by the breweries for malting. The Australian 2-row barleys, Prior and Research, with the 6-row feed barley Glacier from America still form the main varieties grown. No hybridization work with barley

has so far been carried out and the programme has as its aim the introduction and testing of varieties for suitability to the various altitude ranges over which the crop is grown. Unlike wheat, introduced varieties of which are commonly severely attacked by stem rust, introduced barley varieties are often quite successful in Kenya.

A number of new introductions were under test at the various stations and the Scandinavian varieties Kenia and Ymer show promise of success, particularly at the higher altitudes. They are particularly suited for combining due to their stiff straw.

Oats.—The programme, as with barley, is confined to trials of introduced varieties. Varieties from Europe are too susceptible to rust in Kenya to be successful but some from the New World are showing more resistance and trials are continuing. In particular certain crosses of Hajira-Joanette received from Minnesota seem promising. The Australian variety, Lampton, still remains the hay and feed oat and Grey Algerian as the recognized milling oat.

Maize.—The maize breeding work is following the aims outlined in the 1950 report. In-breeding of the various lines continued and a new series of inbreds was started using maizes collected from the African areas of Kenya as well as imported varieties. Trials of single and double crosses made in 1950 were carried out and also top crosses of new selected inbreds to test general combining ability. Further tests with imported hybrids showed, as expected from past experience, that none were successful in Kenya and emphasized that hybrids suited to local conditions must be produced in the Colony.

The Maize Seed Competition, which aims at improvement of yield by seed selection, was again run at the three centres Njoro, Kitale and Rongai.

Sorghum.—The sorghum breeding programme aims at the improvement of local varieties for African use and the production of dwarf types suitable for combining, for use in European farming areas.

Work has been confined to the building up of a collection of local varieties and the testing of imported dwarfs chiefly from America. A number of fodder types is also under test.

Sunflowers.—The three semi-dwarf varieties Mars, Pole Star and Jupiter have now been released to farmers from Departmental control and are in commercial production. They are successful for combining in the lower, hotter, areas but grow rather too tall for mechanical harvesting in the high rainfall areas over 7,000 feet. Work is continuing with selection in the fully dwarf varieties Klein, Southern Cross and Mennonite. Sunrise was on trial for the first time.

Coffee

The introduction from Uganda of further parasites and predators of the mealy bug (*Pseudococcus kenyae*) occupied the major part of the time of the entomological staff during the year. Of the two species of internal parasites which were sought, one, a new species of *Anagyrus*, was successfully introduced and bred, but the other, *Tetracnemus* sp., was very scarce and further collection will be necessary at a future date. Several Coccinellid predators were obtained, are now being bred and will shortly be liberated in the field. Experiments were conducted to find a substitute for banding grease for the control of the ant (*Pheidole punctulata*), attendant on the mealy bug, and it was found that 1.66 per cent Dieldrin emulsion was most effective, followed by Dedetane. Outbreaks of the Lacewing coffee bug (*Habrochila placida* Horv.) in the Turbo district were investigated and it is believed that they were chiefly due to interference with normal biological control of this pest resulting from the use of DDT sprays.

Evidence is accumulating that the use of some of the newer insecticides should be avoided where possible as they are liable to cause serious disturbance of normal biological control.

The Plant Pathology and Physiology Section continued to devote much time to the effect of copper spraying on leaf fall. Experiments are now in progress on several sites to determine the best time for spraying and the optimum concentration, rate and method of application. Attempts to isolate a fungus from the "weak spots" associated with leaf fall again failed and the identity of the fungus remains unknown. Following upon the appearance of Coffee Berry Disease for the first time in the East Rift coffee area, work on this disease was considerably expanded. Studies on the mode of infection of the fungus were started and it is evident that there is some factor, either climatic or physiological, which makes the berries susceptible at certain times. A detailed survey of the areas affected in Kiambu district has been made and a study of meteorological data in relation to disease incidence is in progress. The various strains of the fungus occurring on the coffee bush and the effects of drying on spore viability are being examined. A field trial with various fungicides on a susceptible variety failed to produce any beneficial effect from any of the materials used. Selection for resistance to the disease and high yield is being carried out in a plot of Blue Mountain coffee at Kitale.

Investigations on the use of maleic hydrazide as a growth inhibitor were continued in the west Rift area where shy bearing and other difficulties are probably related to the long growing season which results in starch produced by photosynthesis being immediately used for fresh vegetative growth instead of accumulating to supply the needs of developing inflorescences. Marked growth inhibition was obtained, there was no evidence of any considerable effect on assimilation rate, and there was some indication of increased flower production. Further work was done on "bricky flavour" and it is now clear that this is produced by the use of some BHC compounds as sprays.

The study of soil fertility factors in the manuring, mulching and cultivation trials has now continued over a period of five years, which has covered a range of rainfall conditions, since two years have been extremely dry, two years unusually wet and one year about average. Under Ruiru conditions, phosphate or cattle manure have had no beneficial effect, and nitrogenous fertilizers have given very variable responses which require further study. The very striking improvements in soil structure attained under elephant grass leys were completely lost in two subsequent years of clean cultivation under young coffee. Better water percolation rates have been obtained after two years of all-row grass mulching than after four years of elephant grass ley. Recent work has shown that the beneficial effect of a mulch is due much more to its effect in improving rainfall percolation than to subsequent protection of the soil surface from evaporation. Mulching before the rains has been found much more effective in increasing yields than mulching after the rains. In view of the importance of mulching, trials are in progress to test the effect of manuring on the yield of elephant grass grown for this purpose and to observe the relative efficiency of six species of grasses used as a mulch.

Pyrethrum

Breeding.—Work on the production of improved strains of pyrethrum suitable for different altitudes continued and during the year 1,054 single plant selections were under observation, 41 new crosses between clones derived from promising single plant selections were made in isolated plots, and 12 variety trials were in progress in which the seedling progenies from crosses between selected clones were tested. Very promising results have been obtained from a number of the new crosses in the variety trials and clonal material of the

parents is being bulked in preparation for seed production. Isolated seed production plots of three new crosses (C.43, C.47 and C.51) were established and seed of the first of these was issued. Further single plant selections are being made in the seedling progenies from promising crosses. Seed production of the strains "Molo Bulk" and "1970 Control", which are mass selected, continued as the seed of bred strains available is unlikely to be sufficient to meet the demands created by new plantings. A start was made with a new system of breeding which is expected to have advantages over that used hitherto in that it will produce strains which are more adaptable, combine more desirable characters, and may possess a degree of hybrid vigour. Hitherto, the sole criterion of toxicity in improved strains has been high pyrethrins content, but during the year indications were obtained that in some strains high content is not closely correlated with high toxicity as determined by biological assay. This important finding, if confirmed, will necessitate appreciable changes in the technique of selecting breeding materials.

Bud Disease (*Ramularia bellunensis.*)—Observations on the incidence of the disease were continued for the third year on plots of a single clone established on farms distributed throughout the pyrethrum growing area. Over the three seasons the average bud disease rate, i.e. the number of diseased buds per 100 healthy flowers picked, is slightly under 10 per cent. As it is known that the plant is capable of increased flower production to offset the loss of buds through disease, this disease rate may not result in appreciable economic loss. Contrary to the experience of the previous two years the bud disease rate in 1951 was higher in areas east of the Rift Valley than in the western areas. Two spraying trials with fungicides again failed to yield conclusive results but there was an indication that monthly spraying with Peranox reduced the incidence of the disease. Spraying with zinc sulphate, which was undertaken because analyses in the Belgian Congo suggested that the zinc content of diseased plants was unusually low, was ineffective.

Two trials were conducted on methods of picking and in both it was found that thrice-weekly stripping, i.e. picking all opened flowers irrespective of stage of maturity, gave higher yields of pyrethrins per acre than two weekly selective picking. The effect of picking methods on yields and financial returns per acre is to be more closely studied in 1952.

In one of the fertilizer trials, which was on land known to be deficient in phosphate, an application of 150 lb. double supers per acre applied in the planting holes gave an economic yield response which persisted into the second season. No response has yet been obtained to nitrogen and potash. Farmyard manure was effective in increasing yields in two trials, but its application is unlikely to be economic.

Owing to the large number of routine analyses required and to the fact that the chemical section was understaffed throughout the year, the amount of investigational work which could be undertaken was reduced. A number of experiments aiming at finding means of reducing losses of pyrethrum in transit were conducted but no conclusive results were obtained. It has been found that sampling methods hitherto employed in this work are not sufficiently accurate and this matter is now being thoroughly investigated.

Sisal

Since 1948 there has been a considerable expansion of experimental work on sisal, but the great majority of the field trials now in progress are still less than three years old and consequently few results of importance can yet be reported. The work in hand covers nursery technique, the use of different types

of planting material and various planting methods, spacing and plant management, land preparation, cultivation, rotation of sisal with grass, the application of fertilizers and manures and the study of deficiency diseases.

There are strong indications that sisal is likely markedly to respond to fertilizers and manures. In three nursery experiments application of sisal waste or sulphate of ammonia has been beneficial in increasing the rate of growth of the bulbils. The fertilizer experiments with sisal in the field have not yet reached the cutting stage, but leaf counts show that the number of leaves produced at 18 months after planting has been significantly increased by dressings of sisal waste, phosphate, nitrogen and lime, and that some manurial treatments have so accelerated plant development that a first cut is likely to be possible at $2\frac{1}{4}$ to $2\frac{1}{2}$ years. These trials are at present sited only at the Sisal Research Station, but when more information is available it will clearly be necessary to test the effect of fertilizers under varying soil and climatic conditions by experiments on a number of estates.

Four nutritional disorders or "deficiency diseases" are now in evidence on sisal estates: banding disease, purple leaf tip roll, leaf tip dieback and parallel streak. None of these has yet reached serious proportions but Tanganyika experience indicates that they may well become of increasing importance if sisal continues to be replanted on the same land. Banding disease is the only one for which the cause is definitely known but in a single experiment in Kenya the application of potash has not proved as effective in curing the disease as was expected. Analyses of soil and plant material suggested that leaf tip dieback was caused by a deficiency of calcium and/or phosphate but in a field experiment the application of these nutrients has so far failed to effect a cure. Work on these diseases is being conducted in close collaboration with the Tanganyika Sisal Research Station where they are being closely studied by a team of several workers.

Sugar

A large number of imported sugar-cane varieties have now been established in preliminary observation plots at Kibos in Nyanza Province. It was desired to add to this collection during the year by importing recently released, improved varieties from the research stations of the main sugar-producing countries of the world but this was not possible because since the closing of the East African Agricultural Research Institute at Amani no satisfactory arrangements for quarantine have existed. Five trials were planted with canes which had been under observation at Kibos for two years or more, but these trials are still in an early stage. A more advanced variety trial at Miwani Estate, is indicating that the Coimbatore varieties, CO.421 and CO.419 are likely to be markedly superior to CO.281 which is the cane now commonly cultivated. Fertilizer and spacing trials on sugar are also in progress.

Horticulture

Horticultural work is carried out at Molo, altitude 8,300 ft. with temperate fruits and vegetables; at Matuga, altitude 300 ft. with tropical and sub-tropical fruits; and at a sub-station in course of development at Jacaranda, Ruiru, altitude 5,000 ft., with citrus, vegetables and pine-apples. Work on the latter crop is also being undertaken on estates in the Thika district, altitude about 5,000 ft. and in the Coast Province, almost at sea level.

Scarcity of planting material for the rapidly expanding pine-apple industry led to an investigation aiming at finding means of increasing the supply more rapidly than can be done by the orthodox methods of using slips, suckers or tops. The materials used were "discs" produced by cutting up stems which had not fruited, segments obtained by vertical splitting of fruit tops or suckers,

and mature fruit top leaves. Successful results, capable of practical application, were obtained with fruit-top segments set in outdoor sand beds during the rainy season, 95 per cent of the segments producing shoots in 100 days. The best size was that obtained by dividing the top into eight segments: smaller segments were less successful. Drying out of the fruit tops for 21 days prior to cutting up and planting, or the application of plant hormones, was not beneficial. All the other types of material were propagated with varying degrees of success but none was as satisfactory as the fruit top segments. Experiments have been started on spacing and fertilizers and also to find a cure for the very poor performance of pine-apples when replanted on the same land. Sulphate of ammonia has greatly improved the vigour of plants on both new and old land.

Apples harvested at Molo were nearly all heavily affected by "bitter pit"—dark sunken spots on the skin of the fruit with brown and corky flesh beneath. It is thought that this may be caused by excess nitrogen due to fairly heavy annual dressings of farmyard manure.

Symptoms of magnesium deficiency in apples and pears, which vary with the variety but normally include chlorosis and/or necrosis, were cured by four fortnightly applications of 2 per cent Epsom salts solution, spraying starting at the petal fall stage.

The reaction of all deciduous fruit trees, particularly plums, to oil spraying against prolonged dormancy was particularly marked this season and as temperatures were not higher than normal it is thought that the effect of spraying is cumulative from season to season. The effect of oil spraying in increasing plum yields is spectacular.

Difficulties experienced in germinating the seeds of strawberry, blackberry, raspberry and youngberry were overcome by stratifying the seeds in pots of moist sand which were kept in a refrigerator for six weeks. Seed treatment with acid or alkali had no effect.

The Melba strawberry is still much the most successful in Kenya and of the many other varieties tried only the Cambridge seedlings, Nos. 448 and 449, have done sufficiently well to be recommended for trial by growers. Only one plant has so far been raised from the cross Royal Sovereign M.40 × Melba, which was made to try and combine leaf spot resistance and good quality fruit.

Un-replicated observation trials were made with varieties of tomato, beans, lettuce, asparagus and onions. At Jacaranda, "Riverside" was the most successful tomato (3,016 lb. per acre) and Mignonette lettuce yielded at the rate of 6,644 lb. per acre. Texas Grano onion yielded at the rate of 10 tons per acre at Molo.

Grassland

Dr. William Davies, Director of the Grassland Station, Drayton, visited Kenya in September and October, in order to advise on the organization of research in the Colony. He recommended a main grassland research station at Kitale, staffed with three agronomists, a chemist and a plant breeder, together with subordinate staff; and three sub-stations each staffed with one regional grassland officer—at Molo to serve the high altitude areas, at Naro Moru to serve the drier ranching areas, and at Kabete. The Naro Moru station is too small for adequate work on ranching problems and is regarded as temporary, pending arrangements for acquiring a larger area of suitable land. Development of Kitale and Molo stations was in hand during the year, but no station except Kabete was fully established during the year and experienced staff was lacking.

Priority continued to be accorded to ley problems. No grasses superior to Rhodes and molasses have yet been proved for ley establishment at the medium and lower altitudes but *Cenchrus ciliaris, Setaria sphacelata, Brachiaria brizantha,*

Panicum maximum and the Star grasses continued to show promise. There is need for selection of ecotypes of all the indigenous grasses mentioned and for work directed towards improving the seeding qualities of some of them. Cocksfoot and Kentucky 31 fescue show considerable promise at higher altitudes, and the former, so far, appears to have the greater possibilities. Of the legumes, the most promising are lucerne which is very successful under certain conditions but needs work on a greater variety of strains, *Alysicarpus glumaceus* and *Glycine javanica*. Work on ley establishment included trials on undersowing wheat and maize with various species and on row planting of grasses and legumes. Under certain conditions row planting has distinct advantages in economy of seed, control of weeds and efficient utilization of soil moisture.

A wide scatter of exploratory fertilizer experiments showed that phosphate has a very marked beneficial effect on grass establishment and usually increases yields of dry matter if applied with nitrogen. Both on leys and permanent grass nitrogen produced very appreciable yield increases. The response to both nitrogen and phosphate tended to be strongly correlated with rainfall. Both fertilizers increased the yield of crude protein but on newly sown grass nitrogen depressed the lime content of the herbage. Potash and lime had no effect in any of the experiments in which they were included. The results indicate that there are considerable possibilities for the use of nitrogen and phosphate on leys but on permanent grass, although increased production is obtained, it is of lower value and as its utilization necessitates increased provision of fencing, water, etc., and conservation of fodder for the dry season, it is doubtful if the use of fertilizer on any scale is at present practicable or economic.

General Husbandry

African Areas

No fully equipped and staffed experimental station was operating in the African areas during the year, but development of the Embu Station, in the Central Province, and of the station at Matuga, in the Coast Province, was proceeding. A fair amount of short-term experimental work was carried out on existing sub-stations and plots.

Ley problems received attention in most areas, but the work is still in the early stages. In Nyanza Province it has been demonstrated that satisfactory leys can be established with molasses grass over the greater part of the province and grazing trials at Kakamega have indicated that this grass can carry a beast to the acre over the whole year where rainfall is favourable. A number of other species are under trial and those showing promise include Rhodes grass, Pemba grass (*Stenataphrum dimidiatum*), *Paspalum dilatatum, Brachiaria brizantha* and *Panicum maximum*. Pemba grass was found to be exceptionally palatable. In the Central Province leys were successfully established by the end of 1950 under the severe conditions of Machakos district, where rainfall is low and a hard surface crust has formed on the soil as a result of erosion. Scarifying the surface followed by ridging was found to be the best method of preparing the soil and leys were established with Star grass, and *Panicum makarikariensis*, both of which were planted, and by sowing either a mixture of *Cenchrus ciliaris* and *Eragrostis superba,* or Rhodes grass. Under the exceptionally heavy rainfall experienced in 1951 these leys carried up to a beast to the acre for seven months of the year. In the wetter parts of the Embu district, at medium altitudes, trials were begun in 1950 on three sites to find means of improving the carrying capacity of poor pastures containing much useless bush and dominated by *Cymbopogon gigantea*. Removal of inedible material combined with rotational grazing increased the carrying capacity from 0.68 to 1.2 beasts per acre, while a Star grass pasture planted after clearing carried just over three beasts to the acre.

A small number of simple fertilizer trials were carried out in the Central and Coast Provinces without giving conclusive results. In Nyanza Province the effect of fertilizers was investigated by a scatter of trials conducted by the East African Agriculture and Forestry Research Organization.

A problem of considerable importance is to find high yielding, palatable and disease-resistant, short-term sorghums, which will store well, for the drier areas in which maize is an extremely chancy crop. A large number of imported short-term varieties were tried in preliminary observation plots at various sites in the Coast Province and in Machakos district and some of these proved extremely promising in the field, but storage tests are not yet complete.

Cassava varieties, bred at Amani for resistance to mosaic and brown streak diseases, have been obtained from the East African Agriculture and Forestry Research Organization and established at Matuga and Embu. The object is to test them for disease resistance, yield capacity and other characteristics over a range of climatic and soil conditions, and it is hoped to establish plots at other centres in the near future. So far the work has only reached the stage of preliminary observations on disease resistance. Other trials are also in progress with cassava to compare different varieties, times of harvesting, spacing and ridge versus flat cultivation.

In Nyanza Province preliminary cotton variety trials had been conducted over several seasons to test a wide range of material from Barberton, Uganda and Tanganyika. The results had shown that the most promising varieties were U.K.48 from Tanganyika and S.47 from Uganda and in the 1950-51 season these were compared in a number of trials against the locally-grown varieties N.17 and B.P.52. These trials confirmed the superiority of the new varieties and as a result S.47 has been introduced into North and Central Nyanza and it is proposed to replace N.17 by U.K.48 in South Nyanza as soon as seed supplies have bulked up. At the beginning of the 1951-52 season an officer of the Empire Cotton Growing Corporation was posted to Kisumu to take charge of cotton investigations in the Province and during the year small stations for this work were developed at Kibos, Homa Bay and Bungoma. The Nyanza cotton industry, although not large, is an important factor in peasant economy and there is little doubt that considerable improvement will be effected as a result of work on varieties, cultural methods, black arm disease, and the insect pests, Lygus and bollworms. In the Coast Province preliminary variety trials were conducted with the help of the Empire Cotton Growing Corporation on three sites and results indicated that an improvement on the variety at present grown is likely to be possible.

European Areas

Experimental work was carried out at stations at Kitale (6,000 ft.), Eldoret (7,200 ft.), and Ol Joro Orok (7,800 ft.); on departmental plots at Rongai (6,000 ft.), Njoro (7,100 ft.), and Molo (9,300 ft.), and on farms. No full time experimentalist was available and the work was undertaken by field service officers in addition to their advisory duties. Much of it comprised crop variety trials or ley trials, conducted in collaboration with the Senior Plant Breeder or with pasture research officers, respectively, and has already been noted under the appropriate sections above.

Wheat rate of seeding trials were continued for a further season and confirmed the previous finding that seedings of less than 50 to 70 lb. per acre reduce yields, but above this figure yields remain fairly constant up to the highest rate of seeding used, 150 lb. per acre.

Fertilizer trials with barley, using two levels each of nitrogen, phosphate and potash at the three centres Njoro, Molo and Ol Joro Orok, showed that the application of phosphate significantly increased yields but neither sulphate of

ammonia nor muriate of potash significantly affected yield. There is a suggestion, still to be confirmed, that potash improved quality as reflected in the grading of the harvested grain.

Fodder crop trials were undertaken at several stations. At Rongai, Brown S.A.O. was the best of five varieties of *Dolichos lablab* tested for seed production, and as it is erect, with few tendrils, it is suitable for combine harvesting. Lupin varieties were tested at Kitale and the sweet blue variety proved best. A local, unnamed, variety of edible canna proved the best in a variety trial at Kitale and yielded at the rate of approximately 39 tons per acre.

Trials are in progress on the utilization of poorly drained "vlei" soils for arable cultivation. At Londiani, the application of phosphate proved to be of more importance than mole draining. At Ol Joro Orok, satisfactory crops of wheat and oats were obtained on land drained on the ridge and furrow system with an application of 75 lb. of double supers per acre and larger dressings of phosphate did not materially increase yields, while, in a preliminary trial, no indication was obtained that liming is beneficial.

PART III—FIELD SERVICES

Progress in Improved Farming

EUROPEAN AREAS

The Provincial Agricultural Officer, from planting programmes, has estimated that in 1951, of the total arable area in the Rift Valley Province, 75 per cent was under wheat or maize. Another 18 per cent was under arable crops and only 7 per cent of the area was devoted to cultivated grass or fodder crops. This picture indicates that a high proportion of the arable land was under monoculture to a cereal crop, fostered by cereal prices in recent years having outstripped the rise in those of animal produce and by the general attitude that so long as soil erosion is prevented soil fertility will look after itself with the aid of phosphates. In all districts a number of the farmers have moved on to a rotational alternate husbandry system and they represent the focal point from which it is hoped that sounder farming practices will radiate. It is expected that a strongly developing awareness will gather weight in the next few years if it can be shown that sound economies are created through the medium of planned farming and that the return from ley farming practices is as profitable as cereal production, despite capital commitments in cereal machinery and the investment required to establish productive livestock.

Planned farming, to achieve its object of reducing costs of production and improving agronomic techniques, is an exacting and detailed task for the farmer himself, the Agricultural Officer and the Assistant Soil Conservation Officer in preparing and applying the surveys, the physical plans and the agronomic and economic planning for each and every farm. Of the 300,000 acres of potential arable land in the Nakuru district, about half is now under cultivation. Of this, some 26,000 acres are fully planned and a balanced rotational ley system is adopted. In addition some 35 farmers have applied for farm planning services on 30,000 acres. Farmers in this district as a whole are tending to grade up their livestock, with pure-bred cattle coming in on farms using grass leys. Where leys are not yet planted, most farmers are producing hay and ensilage for the dry season and average milk yields are going up accordingly, encouraged particularly in 1951 by the good season and better attention to feeding.

In the Trans Nzoia there has been a great increase in alternate husbandry, bringing the area seeded down to Molasses and Rhodes grasses to 13,524 acres with 25,000 acres of arable land allowed to revert naturally to grass. There has been an increase in stock and these develoments have led to increased fencing, water supplies and fodder production. In the Uasin Gishu alternate rotational

husbandry, except in the case of certain European Settlement Board farmers, remains alien to the traditional practices adopted by a large proportion of this community who generally divide their farming units into two parts, one under cereal monoculture, the other under rough ranching. The Thomson's Falls, Ol Kalou and Kinangop districts, although embracing many progressive farmers, offer probems in connexion with drainage which make progress with balanced alternate husbandry and the improvement of grassland difficult on account of sustained water-logging. While progress will be slow and the expansion in wheat monoculture will continue for some years, a solution to the drainage problem and the provision of ley grasses will raise crop and stock productivity enormously. The expansion in wheat acreage has been a particular feature of the Kinangop and the active demand from the North and South Kinangop Production Sub-Committees for a master plan for windbreaks, for the demarcation of drainage ways, for drainage trials, for grassland investigation, for restriction of continuous wheat cultivation and for ensuring permanent supervision on farms has been an encouraging aspect of this year's work.

In the European farming areas of the Nyanza Province, outside the tea-growing areas of Kericho, Nandi and North Sotik and the areas of East and West Sotik producing whole milk for the Kericho tea estates, a great part of the remaining European areas is essentially in a maize-butterfat producing zone with a possible development in the beef trade in the lower areas. Advisory work has stressed grassland management, grass leys and fodder production as a prelude to farm planning when the maps from the 1951 aerial survey become available.

That Agricultural Officers cannot devote more time to constructive farm planning is due to their greatly increased commitments, without any increase in supporting staff, on Production Committee and Board of Agriculture work, on Land Control Board and Water Board inspections as well as their normal advisory duties to farmers, running agricultural stations and demonstration farms and training subordinate staff.

An important incentive to broadening the basis of farming on under-developed and misused farms was the provision in 1951, with the prospect of repetition in 1952, of a fund of £200,000 in the form of the Farm Land Rehabilitation Loan which was mainly allocated, as the appended table (which includes 1952 to 1st May) shows, on the basis of dips and water supplies first, then fencing and finally the purchase of cattle. This assistance differs from Land Bank loans in waiving security against the title to land and in providing a four-year moratorium of interest at 4½ per cent and amortization at 1½ per cent, i.e. until the investment becomes productive.

LOANS APPROVED FROM AGRICULTURAL LANDS REHABILITATION FUND TO 1ST MAY, 1952

District	No. of Loans	Dips	Water Supplies	Fencing	Cattle	Various	Total
		£	£	£	£	£	£
Uasin Gishu ..	102	8,576	5,375	13,490	68,310	—	95,745
Trans Nzoia ..	48	1,450	3,676	6,070	39,020	1,106	51,322
Nakuru ..	27	1,205	2,811	875	21,890	870	27,651
Naivasha ..	26	4,600	2,400	2,265	18,712	748	28,725
Sotik	5	—	3,327	900	3,750	30	8,007
Lumbwa/Songhor	4	—	425	450	5,500	125	6,500
Laikipia ..	6	—	200	800	5,300	—	6,300
Total ..	218	15,825	18,214	24,850	162,482	2,879	224,250

The certification of seed wheat, the object of which is to ensure that the seed is reasonably true to type and free of noxious weeds and rogues, continued to constitute a difficult problem, for the Seeds Officer had to inspect all applications to produce seed wheat which conformed to the requirements in regard to land, storage, etc. In commercial practice the acreage and location of seed farms would be restricted to effect economies in inspection. Certification was applied for in respect of 5,450 acres and 2,874 acres were passed. It is now necessary for wheat that has passed field inspection to undergo cleaning in an authorized plant before the bags are sealed and samples forwarded for germination and bushel weight tests. Plans for the handing over of this service to commercial interests are now being considered.

Asian Areas

In the Nyanza Province protracted discussions resulted at the end of the year in a definite improvement in the price paid to the farmer-grower for cane, in the commencement of work to improve roads, in the decontrol of the price of jaggery, the production of which should be limited by economic factors which will not deter cane growing for sugar production, and in a proposal to establish a small co-operatively owned sugar factory at Kibos. These developments, together with the great cultural improvements introduced on the Miwani Estate, suggest a more hopeful future for Indian sugar growing. Against this the bad weather seriously affected the maize and sunflower crops.

On the farms owned by Asians at the Coast no appreciable food production occurs. The bigger producers of kapok, coco-nuts, sugar and vegetables enjoyed a successful year. Milk from the large number of milking cows in Mombasa does not meet the requirements of the township and it is supplemented by imports from outside the Province. Manure from these dairies is sold to the Indian market gardeners.

African Areas

General.—Many Africans to-day expect a higher standard of living than that which their present farming skill and land can provide. A departmental committee appointed in 1951 to draw up an agrarian policy suitable to deal with population increase, land tenure and the effects of fragmentation of holdings considered that security, health, both human and livestock, and education services had outstripped improvements in land use; that before the people could use the land properly on holdings of economic size appropriate to any ecological zone, a substantial proportion of the people in the densely populated areas of Kikuyuland, Ukamba and the Nyanza Province would require to be resettled in industry or elsewhere, remembering that for this purpose little suitable land remains unoccupied in Kenya. A form of social security is required which will enable a man in employment to maintain his family away from the land, even in old age. In Nyanza it is estimated that up to 65 per cent of the able-bodied male Luo may be away at work at one time. A similar state of affairs exists in Machakos. A preliminary inspection of the 1950 agricultural census had shown that in certain areas of the Central Province the average number of separate holdings per family was ten, with maxima and minima of 29 and 1, that the aggregate distance of holdings from the homestead averaged ten miles return and that some people might be cultivating 20 miles from their homes. In the Alego location of Central Nyanza the land has so deteriorated under maize and cattle that 66 per cent of the land has to be cultivated to win enough food. These conditions render it impracticable for a man to tend his lands properly or to plant grass and graze on small fields if they are surrounded by other people's crops. To manure a field three miles away may require 120 days' work as against three or four days if the land is near. The most serious cause of terrace breakage

arises from numerous boundary furrows. It is hard for agricultural staff to give advice on numerous scattered fields. It is the custom in some districts for a man who has sold land to be able to reclaim it by returning the purchase price. It benefits the purchaser little to lose the residual value of manuring a potato field, or the labour of bench terracing or fencing.

Proposals are under consideration by the Provincial Administration to allow of the issue of special titles to land provided that the units are of an economic size, are not subject to uneconomic sub-division on inheritance and the standard of farming is approved by the Agricultural Officer. Such an incentive could not but benefit the desired consolidation of holdings.

It is against such a background that progress in improved farming in the Provinces must be considered. There is an urgent need to expand the cultivation of high-priced cash crops in areas suited thereto in order to provide for improved living standards and the capital for enclosure, bench terracing, manuring, grass seed, tick control, water supplies and, ultimately, improved livestock. Group farming has its place under reasonable conditions of population-density and soil homogeneity. In densely populated areas reasonable living standards can only be secured from the land by consolidation of holdings followed by the adoption of sound farming methods and a grant of continuity of right to use the land. From this must follow eligibility to receive agricultural credit and the means to raise the quality of livestock to provide an alternative source of income.

Nyanza Province.—Those adjuncts to better farming, education, soil and water conservation and co-operation are described elsewhere in this report. The major achievements during the year were the application of the reward-for-merit scheme, the concentration of effort on focal points, the encouragement of enclosure of individual holdings and fields and the improvement of animal husbandry. A farmer to become eligible for a reward for merit and registration as an "improved farmer", must comply with the three obligatory points of resting an acceptable proportion of his total potential arable land, of maintaining soil fertility with manure or compost and of controlling soil erosion. A number of additional voluntary points provide that the better a man has carried on his husbandry, the bigger the reward he gets. To qualify for rewards in succeeding years, improvement must be progressive. These points include rotation of grass with crops, diversification of cropping, control of grazing, livestock limitation, tick control, castration of surplus bulls, hedging and good crop, wattle and tree husbandry. The form that rewards take includes payment of half the Agricultural Betterment Fund cess for maize, having a certificate of good husbandry, delivered in three-ton lots, carts sold at reduced prices, wheelbarrows, farm implements and tools, free labour for approved work such as hedging and fencing, assistance with planning and layout of a man's holding, agricultural credit or a cash reward. Progress with this scheme in 1951 is shown in the following table:—

REWARDS FOR MERIT: NYANZA PROVINCE

District	*No. of Recipients*	*Cash Value* £
North Nyanza	439	7,896
Central Nyanza	2	15
South Nyanza	35	1,126
Kericho	1,062	7,749
Total	1,538	£16,786

Encouragement is being given to the consolidation and enclosure of holdings. This may start by a desire to protect crops from livestock as in Kericho or the use of live Euphorbia wash-stops in Central Nyanza. The enclosure of consolidated individual holdings is the first step in the establishment of a real individual title to the land and of an improved standard of husbandry and must be followed by the hedging of individual fields. This has, with the encouragement of the Agricultural Department, become very nearly the general practice in the Buret division and is developing in the other divisions to make Kericho one of the most advanced districts agriculturally in Kenya. Elsewhere the only evidence of a will to enclose comes from the Northern division of North Nyanza and the Highlands division of South Nyanza. The object of second-phase group farming in Nyanza was to achieve consolidation of holdings by reallocation within a kinship group which would have led to enclosure. Unfortunately so much suspicion has been caused by group farming that little progress has been made.

Where enclosure of fields has taken place it has provided the incentive to improve management of stock but rapid progress is not expected in Nyanza until there is a sound and stable market for livestock which will encourage the farmer to keep beasts capable of producing a maximum weight of carcase or milk. In the Province a large number of bulls was castrated by Veterinary Scouts. It is mainly in Kericho that progress is being made, 100 people in Buret having their own crushes, spraying and hand-dressing for ticks regularly. In Belgut five dips were in operation at two of which stud bulls were stationed. Over and above the dam construction mentioned elsewhere, in order to reduce movements of stock and hence soil erosion, more local improvement of water supplies in progressive areas is necessary to protect non-immune, improved cattle from passing through unprotected areas to water. As improvement in cattle is an essential feature in improved farming, the Veterinary Department has established a cattle breeding station in each district from which cattle are sold to Africans who are considered capable of looking after them. Demonstrations of how to manage cattle properly on grass are given at all divisional demonstration plots of the Agricultural Department.

While improvement in the production and marketing of meat and milk products is required to raise the African from mere subsistence agriculture, encouragement has also been given to the growing of high-priced cash crops. Sugar-cane has been started in East Kano (Central Nyanza) for sale to the Miwani factory and in Kabras (North Nyanza) for initial jaggery-making and possible sugar manufacture at a later stage. Good progress was made with coffee cultivation in the Northern division of North Nyanza and in the Highlands division of South Nyanza. Primitive land tenure and inheritance at present prevent a really important development of rice, sugar and cotton growing under irrigation on the Kano Plains where there are the beginnings of a good rice industry. A cotton crop of 10,000 bales was expected in two successive years. A maize surplus of 959,000 bags was sold in 1951. A start has been made with pyrethrum growing in the Highlands division of South Nyanza; wattle culture is expanding in the higher areas of the Province while hedge sisal is making an appreciable contribution to the economy in the south-west of Central Nyanza and in Kericho's Lower Belgut.

Rift Valley Province.—The tribes of this Province at the higher altitudes are akin to the Kipsigis of Kericho and hence are good stockmen so that in time they should appreciate the value of grass and of improved stock management better than the Bantu agricultural tribes. In Nandi there is a developing tendency for the people to fence in their holdings and fields, particularly in Kaptumo location, which should establish more permanently productive systems

of crops and grass. The need to guide this enclosure along sound lines is receiving the attention of the Nandi African District Council and of administrative and departmental staff. In Elgeyo fencing of the fields to protect cultivation from stock induces the replacement of the tufted *Pennisetum Schimperi* by Kikuyu grass in the subsequent fallow period. In order to determine and demonstrate the management and economics of such holdings the seed farms at Kapsabet, Chebiemet and Kabarnet have been converted into demonstration farms on which the conception of balanced alternate ley husbandry is being developed on a basis that can be adapted to the African economy.

In the semi-arid areas below 5,000 ft. little progress can be recorded on account of ignorance of a suitable land use system where irrigation is impossible. In South Kamasia, trials are being undertaken with block paddocking and with fodder production to provide dry-season feed.

Central Province.—Although greatest progress was made in Nyeri district, there was a realization in most areas that the land will respond to care bestowed on it to the benefit of the farmer's pocket. Even in the more unpromising parts of Machakos there exists the occasional individual who has made a real effort to tend his holding on reasonable lines. The enclosure of land for grazing purposes continued and in Nyeri and Fort Hall the pastures within were well cared for, even those which but 12 months before had been dense bracken. The campaign for the improvement of pastures by the eradication of bracken in the high zone and of dense bush in the star grass zone resulted in the clearing of 23,320 acres, a remarkable response which, tied up with a greater interest in the management of stock, is expected to expand. In Kiambu progress with improved grazing is less advanced. In Meru, which is leading in the bush-clearing campaign and where the use of manure is increasing, the inter-relation between arable farming and stock-keeping is not yet fully realized. Silage-making is confined to the Kangundo and Matungulu locations of Machakos, but little progress will be made until a crop not consumable by Africans is used. These incentives to mixed farming have yet to be matched by the introduction of an economic beast which will produce more than manure and a bottle of milk a day.

Interest in Kiambu increased in the local manufacture of *boma* manure and compost as a consequence of the increased cost of imported Masai manure. The Embu manure scheme assisted 130 farmers on 800 acres who have to farm their land reasonably well. In Fort Hall and Nyeri the number of cattle sheds making manure increased steadily and large quantities were applied to the land, much of it on bench terraces. Similar progress achieved through young farmers' clubs and better farming societies can be reported from Embu, Nyeri and Fort Hall. A record of progress with bush clearing, grass planting, tree planting and manure and compost making in the Central Province will be found in the table on p. 42.

As progress in improved farming, aided by farm planning, and in consolidation of holdings of economic size proceeds, the serious problems connected with land tenure systems, fragmentation and over-population will inevitably increase. Nevertheless in one area of Mathira Division of Nyeri assistance with farm planning brought about a complete reallocation of land, allowing each man a workable farm. Steady progress with consolidation of holdings and with the expansion of the cultivation of high-priced cash crops, wattle, coffee, pyrethrum, tea, tobacco and hedge sisal, fruit and vegetables, can be expected, so long as the influence of the agitator can be restricted.

Coast Province.—Progress in improved farming lags behind the other Provinces for lack of the incentive of population pressure, except in the Teita Hills

where development in the use of bench terraces and manure, limited by the scarcity of cattle, is beginning to supplement soil conservation measures. Here propaganda goes ahead to encourage stall feeding of cattle, tethering on resting land and the eradication of bracken. In the Native Land Units of Kilifi and Kwale shifting cultivation precludes any major improvement although some success has been achieved in the use of manure.

Reconditioning, Resettlement and Development Schemes

A number of funds exist for the injection of finance into agricultural reconditioning, resettlement and development schemes. They include the African Land Utilization and Settlement Board, Agricultural Betterment Funds held by African District Councils and the Nyanza and Coast Cotton Sales Funds. Some of the schemes so financed which require the advice or supervision of the Agricultural Department are here described. They indicate the importance of integration of plans as between the Veterinary Department, including its tsetse eradication section, the Agricultural Department and the Provincial Administration which at the higher levels is effected by A.L.U.S., and in the field by Provincial and District teams.

NYANZA PROVINCE

Revenue which accrued to African Betterment Funds in the year ending 31st July, 1951, totalled £354,492—while at the end of the year the Nyanza Cotton Sales Fund stood at about £800,000.

Bunyore Scheme.—In the Bunyore scheme which aims at rehabilitating the very overcrowded areas of Southern Bunyore and Maragoli locations of North Nyanza, good progress was made with erosion control by grass strips, with the elimination of boundary furrows between holdings, with the preparation and application to the land of thousands of compost heaps and with the enlistment of the support of agricultural sub-committees. No final solution can come until a proportion of the population is resettled elsewhere. It is estimated that 70 per cent of the able-bodied males are absent from this area at work.

Manyasi Scheme.—This is a scheme to rehabilitate an overcrowded valley in Alego location of Central Nyanza in which success with grass strips and the manufacture of farmyard manure is recorded.

South Nyanza and Central Nyanza River Schemes.—Portions of the valleys of the Kuja, Oyani and Gori Rivers and some rivers in Central Nyanza, disinfested from tsetse fly, were to have been used for controlled settlement schemes financed by A.L.U.S. Their abandonment as special schemes is recorded here as it was brought about by the pre-existence of land user rights.

Lambwe Valley.—This scheme in South Nyanza, which aims at disinfesting a large area of tsetse fly by E.A.T.T.R.O. in conjunction with settlement from overcrowded areas of North and Central Nyanza, has the advantage that no pre-existing land-user rights exist. With the aid of A.L.U.S. funds, blocks of land are handed over to a number of families at the rate of approximately 50 acres per family of which about 15 acres is demarcated as individual rotational holdings, the balance being pooled as controlled common grazing for the group of families. A start with settlement of local families in the Simunye valley has been made but it is hoped that local demand will soon be fulfilled.

Chepalungu Scheme.—The plan of the Field Zoological Section of the Veterinary Department is to create a barrier to join up with cleared barriers in

Trans Mara to prevent the entry of tsetse fly into Kericho district from breeding grounds in Masai. A.L.U.S. funds and staff are used for the making of the barriers and the concern of the Agricultural Department is the proper settlement of the barriers where no pre-existing land user rights occur. Settlers are allowed in at five acres per family in the first clearing stage but will be thinned to about 25-40 acres per family in the final settlement stage, sound land use being insisted upon. The surplus of settlers at that stage will go ahead to clear new land.

Kimulot Scheme.—A.L.U.S. funds and staff are being used to settle correctly land made available for the purpose in the Buret division of Kericho. This is in its initial stages.

Kodera Forest Scheme.—Good progress has been made clearing blocks of land and planting trees in this African District Council forest reserve set aside in a treeless area of South Nyanza after it had been disinfested of a fly causing eye disease in humans. The Agriculutral Department retains advisory control although supervision is undertaken by a European employee of the African District Council.

North Nyanza Mechanical Ploughing Unit.—Besides the North Nyanza Dam Construction Unit, the work of which is detailed under Water Conservation, the North Nyanza African District Council from its Agricultural Betterment Fund has expanded its mechanical ploughing unit which operates in the Northern and Western divisions where large maize holdings exist. Control of the unit is used to induce good husbandry by ploughing only an approved proportion of a holding, by ploughing only suitable land and by leaving grass strips of suitable width for soil control. Charges to African farmers recover the full cost.

Central Province

Makueni Settlement Scheme.—This is the only settlement scheme in the Central Province, 445 settlers having been put on to holdings by the end of 1951. The observance of certain basic husbandry rules is required of settlers, including the preparation and application of manure, the setting aside of dry season fodder, adequate soil conservation measures, rotation round the holding, planting of resting land with grass and the slashing of bush regeneration. These principles were not rigidly insisted upon at first for fear of deterring new settlers and on account of the drought conditions from 1949 to March, 1951, However, with two good crop seasons and with over 2,000 applicants for settlement it should be possible to insist upon the adoption by settlers of these rules of good husbandry in 1952.

Machakos District Reconditioning Scheme.—With the misfire of earlier schemes, a comprehensive scheme for reconditioning eroded Machakos was approved in 1951 by A.L.U.S. for commencement in 1952 to tackle the problem, essentially a human one, by the use of a large European staff and by the use of machinery as a stimulus to communal effort and an encouragement to the individual to improve his farming methods, the follow-up propaganda being an essential part of the scheme.

High-priced Cash Crop Schemes in Nyeri.—In the campaign for the introduction of high-priced cash crops into Nyeri district, grants and loans from A.L.U.S. are developing successfully coffee, pyrethrum and tea growing by Africans in suitable selected areas.

Coast Province

The Coast Cotton Sales Fund stood at about £500,000 at the end of 1951 and expenditure of nearly £38,000 had been approved for the development of the Matuga experimental and horticultural station.

Gede Settlement Scheme.—Although many of the rules, mainly to ensure an arable-fallow rotation and to make full use of the three-acre permanent crop area, have been ignored on account of frequent changes of Settlement Officer, nevertheless the return from cotton alone averaged nearly Sh. 400 per family. Food crops were better though not sufficient to meet full annual family requirements. The Fort Smith Swahilis from Kiambu began to arrive at Mijomboni, which abuts on Gede, in July and planted up the land which had been ploughed for them at the rate of one acre per family. Poor crops resulted from this late planting.

Shimba Hills.—An area of approximately 36,000 acres in the Kwale district affected by tsetse fly and having a rainfall of 50 in. was surveyed in 1950 for settlement. As a preliminary, trials with crops were laid down in 1951 which, together with soil analysis, indicated a phosphate deficiency which affected the yields of cereal crops and cotton. Fair to moderate yields of cassava, sweet potatoes, green gram, Bambara groundnuts, pigeon peas, cowpeas, chillies and gourds were obtained and further trial of crops, fertilizers and manure are planned for 1952 before a decision is taken on the pattern of settlement. Cattle were introduced towards the end of the year.

Coast Hinterland Scheme.—This scheme, financed and staffed by A.L.U.S., aims to open up the hinterland of the Kwale and Kilifi districts at present sparsely populated on account of lack of water, communications and the presence of tsetse fly and to draw off stock from over-grazed areas. The machinery pool constructed dams and roads in both Kwale and Kilifi during the year. The freeing of 2,000 acres from tsetse fly at Vigurungani by the Field Zoological Section of the Veterinary Department opened up some 100 square miles of the 600 square miles of the Kwale Hinterland for stock and humans. Rules to ensure proper land utilization over this area, put up by the Provincial Team in July, still awaited approval at the year's end. The need for control becomes increasingly urgent as humans and cattle push into the area of good pastures, now that water supplies are available, if the damage that has occurred to the land in settled Duruma and Mariakani is not to be repeated.

Soil and Water Conservation

Soil Conservation—European Areas

The heavy rain in 1951 and its persistence throughout the year offered a continual drag to the work of the Soil Conservation Service mechanical units, not only from the actual hours when tractors were unable to work but through the extra time taken to complete any particular job on account of the heavy state of the land. Although some high intensity downpours were recorded, they were not general. Soil conservation works constructed over the previous ten years functioned efficiently under the conditions of 1951 and no reports were received of broken terraces. In fact it was a year which proved to the majority of farmers the value of conservation works. Despite an increase in charges to farmers, the demand for terracing is large and most units carry bookings for the next two or three years. Every effort is being made to reduce the costs of terracing by improving the efficiency of units and repair services and by reducing the amount of terracing necessary by the introduction of alternate husbandry into farm plans.

Having regard to the abnormal rains the fact that 19,563 acres, compared with 20,461 acres in 1950, were protected by all forms of terracing, diversion ditches and cut-off drains represents a creditable effort by the six mechanical units of the Soil Conservation Service. With the new terracing season commencing on 1st October, 1951, charges to farmers for tractor hours (including driver, terracer operator, running costs, transport and depreciation on tractor and machinery), for hire of machinery and operators, for levellers and labour were raised to recover their full cost which had been seriously affected by recent rises in cost of living allowances, of rations and of fuel and spare parts. This meant that the proportion paid by the farmer of the total cost of running a soil conservation unit in the field was raised from 32 per cent to 36 per cent. Charges invoiced to farmers by the Soil Conservation Service during the year amounted to £33,802.

ACREAGES PROTECTED BY SOIL CONSERVATION MEASURES

DISTRICT	1941–48	1949	1950	1951	Total
Trans Nzoia	16,234	2,826	4,679	4,035	27,774
Uasin Gishu	7,200	2,159	6,187	5,354	20,900
Nakuru	23,922	2,771	4,758	5,523	36,974
Thomson's Falls ..	2,795	636	3,281	2,287	8,999
Nyanza	1,983	838	1,083	1,190	5,094
Nairobi	660	76	653	1,174	2,563
TOTAL	52,794	9,306	20,641	19,563	102,304

Although in the Uasin Gishu only 59 acres of wattle were protected in 1951 by terracing, the permanent crops which have been protected by terracing or by contour planting in previous years total 4,114 acres of wattle, 2,561 acres of sisal, 649 acres of New Zealand flax and 2,424 acres of tea, this latter in 1951 becoming the responsibility of the Nyanza unit. In Nyanza terracing of tea lands in 1951 protected 565 acres, bringing the total to date to 1,656 acres. In Nairobi district some 420 acres of coffee were narrow base terraced during the year, raising the total to 835 acres. Here, however, increased mulching of coffee is reducing the need for terracing, a fact recognized in an amendment to the Land Conservation Rules, 1945. In sisal, some 265 acres were contour planted.

The Nairobi District Council requested the application of the Land Conservation Rules, 1945, to the area under its jurisdiction and, having complied with all formalities, gazettement alone remained at the end of the year. The other two districts to which these rules have been applied are those of the Aberdare and Naivasha District Councils. During 1951, the Director of Agriculture issued 88 orders under the Land and Water Preservation Rules. Of these, 51 were orders to have land terraced, which also enables farmers to take out loans for the work from the Land Bank, and the remainder were orders closing eroded fields, drainage ways, river banks or steep slopes to cultivation, often by squatters. In Uasin Gishu 1,432 acres of squatter *shambas* were set out for contour trash lines while in the Nairobi district 237 miles of narrow-base terraces were set out in African cultivations on European farms. In Kericho, 800 acres of squatter cultivation were lined out and protected.

TABLE E.—SOIL CONSERVATION SERVICE—EUROPEAN AREAS

Output of Terracing for year 1951

District	No. of Farms Treated by Tractor	Acreage Protected by					Complementary Works				
		Broad Base and V Terraces	Diversion Ditches or Cut-off Drains	Narrow Base Terraces	Bench Terraces	Total	Roads	Excavation (*a*)	Training Banks	Outlet Drains	Cut-off Drains
							Yards	Cubic ft.	Yards	Yards	Yards
Trans Nzoia ..	50	3,973	60	—	2	4,035	88,003	906,564	2,640	2,670	30,953
Uasin Gishu ..	44	3,520	1,834	—	—	5,354	44,032	110,779	—	18,780	23,638
Nakuru ..	33	2,644	2,733 (*b*)	146	—	5,523	56,837	54,262	72,097	2,345	60,313
Thomson's Falls	20	1,737	550	—	—	2,287	119,537	66,000	—	550	17,883
Nyanza ..	17	1,188	—	—	2	1,190	3,433	271,103	547	4,233	8,880
Nairobi ..	6	485	243	420	26	1,174	9,693	112,298	402	5,082	5,729
Total ..	170	13,547	5,420	566	30	19,563	321,535	1,521,006	75,686	33,660	147,396

(*a*) Completion of terracing, finishing off high and low spots, levelling ant-hills by Soil Conservation Service labour, Farmers' labour or machine (bulldozer, traxcavator or scraper).

(*b*) Cut-off drains used as sole protection in planned farms to land of small slope but not as part of a terracing system.

Farm planning, described in an earlier section of this report, was undertaken as follows:—

FARM PLANNING

DISTRICT	Farms Surveyed and Mapped		Farms Planned	
	No.	*Acres*	*No.*	*Acres*
Nakuru	7	4,002	6	3,550
Thomson's Falls	4	3,484	4	3,484
Nyanza	1	2,131	—	—
Nairobi	1	210	1	210
TOTAL	13	9,827	11	7,244

The 1950 and 1951 aerial survey programmes covering 77,400 acres of farms were flown in January and February, the value to the contracting survey firms being £5,950. Shortage of departmental staff to complete ground control work prevented completion of the plotted plans of more than 23 out of the 51 farms by the survey companies before the end of the year.

It is hoped that by the end of 1952 the Kitale and Nakuru Workshops will be so developed as to be able to undertake the full maintenance and overhauls of all tractors, machinery and vehicles operating under the Soil Conservation Scheme and of departmental farm equipment in their vicinity. Progress with securing plans for and with the building of the offices and quarters required to accommodate the engineer's section of the Soil Conservation Service at Nakuru was slow but by the end of the year the Public Works Department had commenced two Class IV houses. Completion of Engineers' Headquarters will greatly facilitate co-ordination of their work. At the Soil Conservation Conference in July it was agreed that a school for the training and upgrading of African Levellers, for both European and African areas, be set up under the engineers' section and that the existing school at Kitale be used for this purpose. It is intended that, when the school is in operation, a system of trade tests will be introduced to relate the salaries and promotion of African staff to their knowledge and practical experience.

SOIL CONSERVATION—AFRICAN AREAS

Nyanza Province.—In Nyanza the main soil conservation measures adopted are the continuous grass strip demarcated by suitable hedge plants on slopes below 8 per cent and of narrow base terraces on steeper slopes.

Progress with trash lines in the Highlands division of South Nyanza and with grass strips in the Buret and upper Belgut and Sot division of Kericho was maintained, giving about 95 per cent protection to land under cultivation. In lower Belgut and Sot soil control was less effective but work on grass strips with live wash stops was being intensified. In South Nyanza some 75 per cent protection was afforded in the Southern division by grass strips and in the Gulf division by grass strips with wash stops. In the more backward districts of North Nyanza and Central Nyanza a great advance was made at focal points in each location with the system of grass strips with live markers in the lower wet areas or backed by live wash stops of aloe or Euphorbia in the drier areas, replacing narrow base

terracing and making the responsibility for construction and maintenance individual rather than communal. As this work is still in the focal stage, it is too early to estimate the area of land protected except for the 50 per cent protection achieved in the Bunyore scheme. Closure of grazing was effected in several overgrazed localities in North Nyanza, Central Nyanza and South Nyanza. In Kericho common grazings are rapidly disappearing with enclosure. Periodic closure of even good common grazings occurs. Reconditioning by closure of a part of the "Passchendaele" area of Location 5 was successful.

Central Province.—While narrow base terracing in the Central Province made good progress, 19,016 miles of terraces being constructed to protect 69,060 acres compared with 20,434 miles protecting 80,765 acres in 1950, two important developments occurred during the year. The first was the marked and voluntary response to bench terraces, of which 304 miles were constructed compared with only 32 miles in the previous year; the second, the demand in Nyeri for "farm planning", which is quite beyond the present services available and this in spite of difficulties connected with the land tenure system. Bench terracing helps to utilize steeper lands for cash crops and productivity is boosted by heavy manuring.

In Machakos communal work achieved was unimpressive and the response of the people unenthusiastic. It is hoped that with an increase in staff, some mechanical assistance, and the injection of funds by A.L.U.S., improvement will be effected in 1952. One of the major tasks in all districts, and one which will never be overcome or stabilized except by bench terracing, is the need to recondition annually terracing systems constructed in past years. In 1952 20,902 miles of terraces protecting 88,896 acres were renovated. Labour gangs and line levellers paid by A.L.U.S. continued to deal with the more difficult areas of erosion in Nyeri, Fort Hall and Kitui.

Conditions for grass planting were admirable over long periods of 1951 and the 42,491 acres planted, unfortunately not all of which is permanently protected, represents an outstanding effort by the people of Machakos and Meru in particular and should be very evident in a few years' time, plantings from previous years having responded well from the excellent rains.

With the exception of the first three months of the year, grazing has been abundant and this has facilitated grazing control measures, areas set aside solely for grazing, such as Simba-Emali and the Yattas, presenting a picture of plenty at the end of the year. In the Ukamba districts effective grazing control over wide areas has yet to come but the work of the Chief of Masii in Machakos and the enclosure of reclaimed areas in Kitui are giving a lead.

Coast Province.—Except in the Teita Hills and to a lesser extent in Kwale district, soil conservation is in but an elementary stage in the Coast Province due to a primitive and apathetic population, the scattered nature of cultivation and the low standard of education of Agricultural Instructors. Also, staff being scattered sparsely over large areas, reliable statistics of acreages protected are difficult to secure. It has been necessary to supplement the use of the trash line by yard-wide strips on to which all weeds and trash are thrown. Live wash stops are still under trial in the lowlands while an effort to demarcate lines with castor plants aims at avoiding the need to realign fields annually due to the destruction of trash by white ants. In the Teita Hills increased enthusiasm for the Vegetable Co-operative Society and for coffee planting has effected a large increase in the

TABLE F.—SOIL CONSERVATION FIGURES FOR 1951—CENTRAL PROVINCE

District	Acres Terraced (New)	Acres Terraced (Reno-vated)	Acres Bench Terraced	New Cattle Sheds Built	Cattle Sheds Emptied	Compost Stacks Pits in Use	Grass Planted Acres	Number of Trees Planted	Bush Clearing Acres
Meru	7,557	5,800	355	625	(i)	23,857	12,427	527,859	10,120
Embu	15,671	66,100	(i)	(i)	(i)	(i)	265	236,991	(i)
Nyeri	11,253	4,883	89	1,464	6,519	(i)	2,814	518,052	7,160
Fort Hall	14,196	3,500	40	1,956	1,851	4,196	6,500	(i)	6,000
Kiambu	9,044	8,613	7	(i)	(i)	(i)	1,954	(i)	(i)
Machakos	7,685	(i)	14	(i)	(i)	(i)	14,890	(i)	—
Kitui	3,654	(i)	85	—	—	—	3,641	30,000	40
1951	69,060	88,896	590	4,045	8,370	28,053	42,491	1,312,902	23,320
1950	80,765	(i)	(i)	(i)	(i)	33,547	11,649	(i)	(i)
1949	80,933	(i)	(i)	(i)	(i)	20,820	5,614	(i)	(i)

(i) Figures not known.

acreage laid out to bench terraces, coffee growers alone having prepared 300 plots measuring 75 acres for planting in 1952. Some success was achieved with gully stopping and grass planting in the low zone of Mbale, Mbololo and Bura locations. In the Kwale district, of 490 miles of trash lines, 260 miles were laid in Duruma and 230 miles in Digo. Cultivation of river banks and roadsides was stopped. In Kilifi 270 miles of trash lines were laid, protecting 810 acres. The closure of eroded cattle tracks in the Ngumbo wa Patso area of Rabai was effected.

Rift Valley Province.—No statistics can be provided of acreages protected but a visual estimate suggests that 10 to 20 per cent of the arable area is effectively protected against wash, that 80 to 90 per cent enjoys some form of protection but that probably 50 per cent of this is ineffective. Different systems are necessary for the well-defined ecological zones in the Province. In the high grazing country of north-east Nandi, Lelan. Metkei, the Leroghi Plateau and the highland masses of Samburu, the main conservation measures are the provision of water supplies and the control and management of grazing in relation thereto. During the year most of the money available in Samburu was diverted to repairs to dams. The simple seasonal grazing control at present applied in these areas aims at the preservation of grazing for the dry season, the only fodder conservation at present practised, and at providing a resting period for the recovery of herbage. On the Leroghi Plateau, the grazing management is more advanced, being grazed for short intensive periods and rested rotationally under the control of grazing committees. The year has been exceptionally favourable for the recovery of grazings.

In Nandi, the Kabarnet Highlands, Higher Elgeyo, the Lembus Forest area of Baringo and around Kapenguria, the arable areas have a rainfall, altitude and temperature suitable for ley farming or for mixed arable and pasture areas. Here fields are protected by either narrow base terraces, trash lines or grass strips, with contour cultivation where draught implements are used. In Nandi a recent A.D.C. resolution limits the cultivation period of land to three years.

There is an intermediate level in the Province, low West Suk, the Tambach ledge and the foot of the Elgeyo escarpment, the foothills of the Kabarnet Highlands and run-off catchments in South Kamasia where, with low, badly distributed rainfall and high temperatures, we have at present nothing better to offer than traditional shifting cultivation practices, ensuring short periods of cultivation and long periods of bush fallow, simple soil conservation measures in cultivated lands and their protection from denudation by stock after harvest. In the driest areas of East and West Suk, the Kerio Valley, lower Samburu and lower Kamasia, the main conservation measures must be control of stock numbers, grazing control and better distribution of water points.

Water Conservation.—The Engineers' Section devoted their principal attention to the surveys, plans and specifications required for, and to the control of, the operations of Nos. 1 and 2 of the North Nyanza Dam Construction Units. They organized the contract for the construction of dams and water holes in Central Nyanza and advised on the contract for dams in Kericho. They also gave general advice concerning dam construction in South Nyanza, Kericho, West Suk, Baringo and Kitui districts. The Soil Conservation Engineer, Kitale, took charge of the aerial survey programme and the development of the school for levellers and the central workshops, progress in the last two being delayed until 1952. In order to maintain a record of dams, water holes and other hydraulic works should they give trouble in the future, a Central Register has been started,

containing all hydraulic works with which the Engineering Section has been associated. The total number of jobs on the Central Register was about 350 at the end of 1951.

Mechanical Dam Construction Units.—The work of all Dam Construction Units and contracts was seriously set back by the exceptionally heavy rains in March and April and by the recurrence of heavy rain in October, November, and December. Happily no reports were received of any Soil Conservation Service-built dams failing due to heavy flood flows, although the areas in which the Nos. 1 and 2 Units had been working were areas which suffered from the exceptionally heavy rains. There were cases of spillways being badly eroded but this was usually due to the fact that they had only been finished just before the rains began so that grass had not become established on them. During the year No. 1 D.C.U. worked in Machakos, constructing ten dams on European farms and three in African areas, bringing the total constructed in the Kamba Reserve to seventeen. No. 2 D.C.U. worked in the Thomson's Falls and Ol Joro Orok areas of the Uaso Nyiro Regional Water Board, where it was delayed by the persistence of rain. The North Nyanza D.C.U. which has the loan from Government of two European officers and four large tractors, is otherwise owned and financed by the North Nyanza African District Council. The unit operated throughout the year north of the Broderick Falls-Bungoma-Myanga railway line except during the months of July to November, when it constructed the new African Sports Stadium at Kakamega. The Uasin Gishu and Thomson's Falls Soil Conservation Service Units, as in past years, continued their dam building activities on sites which were adjacent to areas in which their terracing units were working. They have demonstrated that Soil Conservation Service District staff can build satisfactory dams provided they have sufficient equipment.

In Kericho district Mr. Trench's contract was supervised by the Agricultural Officer (African Areas) but the work is done to the design and specifications of the Engineers' Section, assisted by the departmental surveyor for Nyanza Province. In Central Nyanza district Messrs. Taylor Woodrow's contract for 42 water-holes and seven dams, valued at £15,000, was organized and supervised by the Engineers' Section with a surveyor posted to the job as Clerk of Works.

DAM CONSTRUCTION—1951

UNIT	No. of Dams	Main Wall Volume	Water Storage	TRACTOR HOURS WORKED			Charges Invoiced
				Dams	Other	Total	
		Cu. yds.	*Mil. gal.*				£
No. 1 D.C.U. ..	13	127,097	124	4,912	1,426	6,338	15,327
No. 2 D.C.U. ..	29	219,833	139	3,771	1,269	5,040	12,423
N.N.D.C.U. ..	9	68,870	71	3,318	2,100	5,418	6,086
Uasin Gishu S.C.S. ..	4	15,632	23	506	—	506	1,158
Thomson's Falls S.C.S. ..	4	12,850	9	250	—	250	533
Kericho Contract	3	20,000	12	500	—	500	960
Central Nyanza Contract ..	17	47,685	19	1,700	—	1,700	6,719
TOTAL ..	79	649,967	397	14,957	4,795	19,752	43,206

WATER SUPPLIES—AFRICAN AREAS

In the Nyanza Province water supplies were improved to the extent of nine dams constructed by the North Nyanza Dam Construction Unit, of one dam and sixteen water-holes constructed under contract in Central Nyanza, of six dams constructed under contract in Kericho and of four hand-made dams in the Gulf division of South Nyanza. Of the 163 dams and water-holes constructed in the Nyanza Province to date, 104 are in Kericho African areas, 28 in the Central, 22 in the North and 9 in the South Nyanza districts.

In the Central Province Kitui continued to play an outstanding part in the provision of water supplies, 54 locational dams being built under the supervision of the District Commissioner, bringing the total constructed communally to 190, only three being lost in this year of torrential rain. In Machakos beside 12 small ox-made and famine relief dams, No. 1 Dam Construction Unit constructed three dams. Three dams were constructed in Nyeri by the district's own small self-contained mechanical unit, three others being repaired and two enlarged.

In the Coast Province dams constructed during the year, mainly financed by A.L.U.S., included 18 dams and two rock catchments in Kilifi, four dams in Kwale and four dams and several weirs and piped water supplies in Voi district. Repairs to ten dams in Kilifi and eight in Kwale were necessary after the heavy main rains.

In the Rift Valley Province, three small dams were constructed in the Lessos area of Nandi, five in Elgeyo and one at Ngendalil in Baringo while the Ptoyo dam in West Sotik was completed.

Drainage.—There are scores of thousands of acres of wet land in Londiani, Kinangop, Wanjohi and Thomson's Falls where drainage and grassland research, added to our knowledge of phosphate manuring and of suitable wheat varieties, could enhance the productivity of the land several fold. Visual observation indicates that after heavy rain a sheet of water lies or moves very slowly over the surface of the ground according to the slope, little percolation taking place through the impervious clay layer into the tuff below. Where water moves over ploughed land sheet erosion occurs. The topsoil dries out rapidly after rain, the light grey soils of the Kinangop soon blowing up in dust. A trial of shallow surface drains laid down in 1950 on 80 acres of grassland at Wanjohi showed improvement over the adjacent rough grazings. In trials at Londiani, although mole draining did not give the significant increases in yield of wheat that phosphate manuring effected over control plots, nevertheless in this wet year combine harvesters could operate on moled land whereas they sank into the soil on unmoled land.

Ridge and furrow ploughing offers a practical solution to drainage in all areas and has shown a beneficial effect on crop yields if properly managed from year to year. Investigation into problems of width, grades, length to intercepting ditch and of methods of ploughing and maintenance are being continued. In the Thomson's Falls-Kinangop area 762 acres were marked out in 1951 on farms for ridge and furrow drainage. In Nakuru district progress was made with the demarcation of drainage ways in the Solai drainage scheme. Remaining cedar posts were replaced with scrap railway sleepers in the Rongai drainage scheme.

Agricultural Education

EGERTON COLLEGE OF AGRICULTURE

The main development during the year was from the tuitional and disciplinary angle. The standard of the diploma course was raised to conform more closely to the National Diploma of Agriculture in Great Britain and, with fewer changes

than in 1950, the teaching staff was kept busy designing and consolidating the courses of study in the various subjects. The demand for Egerton-trained men exceeded the supply at the end of 1951 by eight times as many offers of employment with reasonably good conditions as there were students completing the Course.

Of the four students who started the final year of the Diploma Course, two completed it successfully, as did fourteen of the twenty-two students commencing the first year. Nine of the sixteen students taking the Certificate course were successful at the end of the year. Two short courses, each of a monh's duration, were held, one in March in Animal Husbandry and one in November in both Animal and Crop Husbandry, and were attended by a total of 43 students consisting of farmers, farm managers and Government officers.

On the practical side most candidates were required to have worked for at least a year on a farm before joining the school. Throughout the courses the students devoted two mornings a week to practical work on the fully developed 600-acre school farm and for two weeks in each term every student undertook early morning and evening duties in the arable, dairy, pig and poultry sections. Visits to various farms as part of their instruction were made by students. Practical training in the sciences was provided in the chemistry, biology, dairy and veterinary laboratories as well as in the engineering workshop. The women's hostel was completed by the end of the year and building commenced on the assembly hall.

African Areas

Training of Agricultural Instructors.—This continued at the Siriba Combined Training Centre for the Nyanza Province and at Embu in the Central Province while in the Coast Province it was possible in November to move the school from Kibarani to the new buildings at Matuga. At Embu and Matuga the students have the advantage of demonstration on the adjacent Provincial investigation stations as well as the practical training on their own school farms. Although there has been an improvement in the academic standards of pupils coming forward for training, it is still inadequate. As the educational plan for the Colony and Protectorate develops, it will be necessary to insist on a standard better than a pass in the Kenya African Preliminary Examination. Even so, with a static departmental establishment, it is possible to enforce a rigorous weeding out of unsuitable pupils. It is still necessary to provide a one-year certificate course for the more backward districts. Refresher courses were held at these schools for Agricultural Instructors and for school teachers.

Province	Two Year Course		One Year Certificate Course	Total
	1st Year	2nd Year		
Nyanza	25	30	—	55
Central	26	24	10	60
Coast	10	9	5	24
Total	61	63	15	139
Failed	8	17	—	25
Total Passed	53	46	15	114

Bukura Farm Institute.—Twenty African farmers from the Nyanza Province with their wives took the one-year course, each family taking possession of a grouped or ungrouped holding. Of these, 15 were successful and will be followed up on their return home by the departmental staff in the field, good reports having been received of the farming of the majority of those who left at the end of 1950. The holdings average 8.27 acres each and carefully kept records showed that, despite reduced yields from the abnormal long and short rains, a mean profit per holding of Sh. 496/80 and per acre of Sh. 60.07 was made, one farmer only suffering a net loss. The holdings are run on a proper grass and plough rotation with fenced or hedged fields and an important development was the introduction of good indigenous Zebu breeding cattle to make use of the grass, many cattle of poor quality being disposed of. While the Institute is at present financed by a grant from African Land Utilization and Settlement, the North Nyanza African District Council will assume responsibility for expenditure after 1953. Refresher courses were held for 98 Agricultural Instructors from Nyanza Province and 11 teachers while in all 831 persons visited Bukura. Plans were under consideration for the development of farm institutes in each district of the Nyanza Province.

School Gardens.—The interest taken in school gardens in the Central Province continued to develop with a strong competitive spirit and much of the progress in adjacent areas with bench terracing and manure and compost making can be attributed to the dmonstrations to be seen at schools. Their activities are closely allied to the formation of Young Farmers' Clubs and Better Farmers' Societies, which movements continue to grow. In the Nyanza Province the basis of instruction at schools is the "21 plots" demonstrating the local rotation with the use of resting grass and contrasted cultural treatments. Here divisional officers and senior instructors adopt schools with good results. At the Coast schools were visited regularly by departmental officers and instructors.

Farmers' courses given at the Jeanes School by the Commissioner for Community Development have been commented on favourably by the districts from which the farmers were drawn.

Agricultural Shows

The West of Kenya Show was held at Eldoret in March. At the Royal Show in Nakuru in October the Departmental exhibits covered the Egerton College of Agriculture, silage making, pasture grasses and dam spillway construction. In African areas successful agricultural shows were held in the Coast Province at Kwale, in the Central Province at Meru, Fort Hall and Kitui and in Rift Valley Province in Elgeyo. These shows provided excellent entertainment for the large numbers of Africans attending and, without doubt, some agricultural knowledge was absorbed from them. In Nyanza Province the locational show or "country fair" has proved to be more effective educationally and seven of these were held covering the West Kano, Seme, Sakwa and Alego locations of Central Nyanza, Wanga and Malakisi in North Nyanza and Kanyamkago in South Nyanza. The livestock side was stressed at each and educational demonstrations were prominent.

Marketing

Produce Marketing and Inspection

The control of marketing and inspection of produce from African areas devolves on the Agricultural Department to the point where maize and produce is accepted by Maize and Produce Control, wattle bark by the wattle companies or cotton to the point of delivery to the Uganda Lint Marketing Board from Nyanza or to successful tenderers at the Coast. Controlling this and supervising the accounts of co-operative societies are four marketing officers in the Nyanza Province, four in the Central and one at the Coast, whose salaries and expenses are

met from a cess of 20 cents per bag of maize and produce handled by Maize and Produce Control, the bulk of the funds, except in the rare bumper year such as 1951, coming from the Nyanza Province. Except in North Nyanza, the African District Council staff is controlled by these marketing officers. The quantities of produce passing through markets is shown in Table D.

In Nyanza, while the inspection and purchase of the 1950-51 maize crop was easy because the harvesting season was dry, the 1951-52 maize crop was grown and harvested under very wet conditions and markets had frequently to be closed because of excessive moisture in the grain, maize of inferior quality being rejected. This led to unduly long retention by the grower and will increase infestation by weevils. New grading rules became effective with the new crop and the high standard of inspection of recent years was maintained. The dry season, a reduced incidence of pests and diseases and rigorous inspection resulted in a very clean crop of cotton being bought in the 1950-51 season. Conversely, inspection, grading and quality were adversely affected by the wet weather of the 1951-52 season.

In the Central Province, on the other hand, the unusually heavy sales of produce at first caught the inspectorate unawares, trouble occurring over the quality of beans accepted at Sagana and over produce coming in from Kitui. Reorganization soon put this to rights. The commencement of operations in 1952 by the Kenya Horticultural Union will provide a wanted outlet for the organization of marketing of fresh produce by marketing officers. The European Wattle Bark Inspectors, paid by the wattle companies, were beset by the usual difficulties, including the carry-over of bark from previous seasons due to the inability of the East African Railways to move the accumulations, the cutting of immature trees, the high percentage of undergrade bark offered for sale because of its remunerative price, growers often not bothering to pick out the F.A.Q. Marketing and quality of wattle bark were also affected by the continued rain in the August-October season. African District Councils earned over £60,000 from their cess on wattle bark but no contribution was made to the payment of marketing officers, an inspection fee meeting the salaries of wattle inspectors.

Although the Coast Province Marketing, Inspection and Improvement Rules were introduced at the beginning of the year, except for superficial inspection carried out on cotton, cashew nuts, copra and, to a lesser extent, vegetables and kapok, marketing of controlled produce alone proceeded on organized lines in this Province.

Co-operation

In the Nyanza Province agricultural co-operative societies operate with varying degrees of success for the marketing of maize in North Nyanza, where a union of primary societies was formed, ghee (North and South Nyanza), of coffee by the South Nyanza Union of Coffee Growers' Societies, and of poultry and eggs. A new society was formed in 1951 in South Nyanza for the sale of pyrethrum.

In the Central Province, as in Nyanza, the appointment of an Assistant Registrar of Co-operative Societies has been of great benefit, the Meru Coffee Societies receiving his first attention which will later be extended to those societies which are worth saving. The rapidly expanding Meru coffee industry is now in need of full-time European management to place the nine primary societies with their membership of 4,627 on a sound footing and to relieve the Agricultural Department of this responsibility and work. In Nyeri district the marketing officer acts as honorary treasurer to those societies working on sound lines. To the registered 24 societies, many of which were unsatisfactory, were added six new co-operative societies to handle the developing coffee and pyrethrum crops.

The vegetable crop of 742 tons from the Teita Hills of the Coast Province was marketed through co-operative societies, the straightening out of whose affairs absorbed much of the time of the marketing officer.

Crop and Produce Storage

The Colony's wheat crop is handled by the Kenya Farmers' Association. The storage capacity for maize and produce of 1,326,000 bags built or hired by Maize and Produce Control, is distributed as to 241,000 bags in the European Highlands, 575,000 in the Nyanza Province, 85,000 in the Central Province and the balance of 385,000 meets storage and export requirements in Nairobi and Mombasa. Such railhead storage has proved very necessary to spread demands on the East African Railways for transport and to even out the supply to the consumer or for export. Further, provision is made in the price structure for the European maize grower to hold on the farm a proportion of the crop for a period of up to six months after harvest. All grain in storage is protected by insecticides against pest infestation, while conditioning plants are run by Maize and Produce Control at Kisumu and Nairobi. The protection of stored products is under constant review and investigation by the Stored Products Committee. The most urgent future need is for silo storage for export combined with a conditioning plant at Kilindini to replace the present obsolete plant there.

Grading and Inspection Services, Mombasa

Inspection.—The number of packages of imported plant material and products inspected increased once again from 177,840 in 1950 to 237,550 in 1951. Phytopathological certificates for export totalled 99 while 92,102 bags of castor seed, all but 23,104 emanating from Uganda, were inspected for export to ensure that bags were properly sewn and marked. This compared with 32,892 bags in the previous year.

Grading.—Most of the maize received for grading had been stored for a considerable period and all had to be treated in a conditioning plant before export. Similarly, much of the balance of the 1949-50 and the first exports of the 1950-51 wheat crop had to be treated at the Mombasa maize conditioning plant before export. The bulk of the commercial beans submitted for grading were of the white haricot type, requests for the grading of seed beans being greatly reduced with the increased use of insecticidal dusts.

Produce Graded for Export (Bags), 1951

	Maize	Wheat	Potatoes	Beans
K.1	—	235,119	—	2,576
K.1 S.W.	—	8,196	—	—
K.2	—	8,874	34,118	14,006
K.2 S.W.	—	910	—	—
K.3	—	552	—	12,216
K.5	—	—	—	3,619
K.8 C.	163,903	—	—	—
K.8 S.W.	1,837	—	—	—
K.8 Y.C.	4,547	—	—	—
Total Graded	170,278	253,621	34,118	32,417
Wet	107	26,960	—	—
Musty	17	—	—	—
W.L.	—	16,589	—	—
Rejected	4,624	281	1,615	—
Total Received	175,035	297,451	35,733	32,417

Towards the end of the year the grading regulations for chillies were amended, lowering the standard of F.A.Q. for *Capsicum minimum* to something more like the fair average quality of this crop, renaming the former F.A.Q. standard "Good Average Quality". It is too early to ascertain the effects of this change. As there was no commercial objection, the F.A.Q. standard for *Capsicum annuum* was also revised to admit a higher proportion of shorter fruits.

CHILLIES GRADED FOR EXPORT (BAGS), 1951

	Capsicum Minimum	Capsicum Annuum	Total
F.A.Q.	42	24,510	24,552
Undergrade ..	4,646	26,269	30,915
Total	—	510	510
	4,688	51,289	55,977

Conditioning.—Allowing for its age, frequent stops for cleaning due to the variety of produce treated and its capacity, the conditioning plant was kept busy throughout the year, working 4,859 hours as against 3,831 hours in 1950, conditioning 305,084 bags of produce compared with 243,266 bags in 1950 and treating 63.7 bags per working hour. The new bag cleaning machine, commencing in May, treated 304,726 bags.

PRODUCE CONDITIONED (BAGS), 1951

	Conditioned	Fumigated
Maize	101,468	—
Wheat	152,182	—
Beans	29,367	9,517
Grams and Cowpeas ..	9,038	1,627
Imported Rice	13,027	5,019
Miscellaneous Produce ..	—	2,632
Other Seeds	—	1,345
TOTAL	305,082	20,140

Finance.—The combined debit balance of grading and conditioning was reduced by almost two-thirds despite increases in the cost of coal and cost of living allowances and delay in the application of the inspection fee to castor seed. Expenditure covering all the services described totalled £13,537 as against £13,451 of revenue earned.

PART IV—GENERAL

Library

Some 250 new books were bought during the year, mostly for provincial and district libraries and for the research stations. The following journals were added to those already taken by the department: "Abstracts on Agricultural and Horticultural Engineering", "Civil Engineering", "Engineering" and "Empire Survey Review", the last three being for the Soil Conservation Service. Some

2,600 publications were circulated, in addition to those sent to out-stations for retention. The public continued to make good use of the library and an increasing number of inquiries, particularly for statistical information from other departments and consulates, were dealt with.

Publications

The following is a list of articles contributed by departmental officers to local journals:—

East African Agricultural Journal

Vol. 16—January-April—

"The 'Canker' or 'black leg' disease of cabbages and cauliflowers"—R. M. Nattrass, Senior Plant Pathologist.

"A *Botrytis* disease of *Urena lobata* in Kenya"—R. M. Nattrass.

Vol. 17—July-October—

"Plum variety trials at the Horticultural Station, Molo"—T. H. Jackson, Agricultural Officer (Hort.) and Barbara E. Roger, Asst. Agricultural Officer (Hort.).

"Compost making in the Fort Hall district of Kenya"—G. P. Rimmington, Asst. Agricultral Officer.

"Observations on chafer grub: a serious pest of wheat, maize, flax and other crops in Kenya"—R. Le Pelley, Senior Entomologist.

"A note on the release of some new cereal varieties—III"—H. C. Thorpe, Senior Plant Breeder.

Coffee Board Bulletin

"A note on onion flavour"—R. W. Rayner, Plant Pathologist/Physiologist.

"Bricky flavour"—R. W. Rayner.

"A note on an innocuous protective paint for plaster in coffee factory tanks and channels"—A. R. Melville, Senior Entomologist (Coffee Services).

"Coffee berry disease in Upper Kiambu"—R. W. Rayner.

"Mealy bug and Antestia"—A. R. Melville.

"Mulching and Manuring of Coffee"—H. C. Pereira, Agricultural Chemist (Coffee Services).

"Tonic copper spraying"—R. W. Rayner.

"The technique of field experiments"—P. A. Jones, Agricultural Officer (Coffee Services).

"Coffee berry disease"—R. W. Rayner.

"Mechanization of coffee mulching"—H. C. Pereira.

"Weed-killing sprays for use in coffee"—H. C. Pereira.

K.I.O. Fortnightly

"Release of new wheats, 1951 (2721)"—H. C. Thorpe, Senior Plant Breeder,

"Recommended varieties of cereals for growing in the coming season 1951-52 (2728)"—H. C. Thorpe.

"Wheat breeding in Kenya (2796)"—H. C. Thorpe.

Other articles by members of the Department which appeared during the year were:—

"New Hosts of *Phytophthora infestans* in Kenya"—R. M. Nattrass and Moira Ryan.—*Nature,* Vol. 168, No. 4263, p. 85, 14th July, 1951.

"A cylindrical Gypsum Block for moisture studies in deep soils"—H. C. Pereira.—*J. Soil Science,* Vol. 2, pp. 212-224, 1951.

Agricultural Legislation

The following comprise the more important legislative changes affecting agriculture during 1951:—

Grading of Beans (Amendment and Amendment No. 2) Rules, 1951.—Excludes seed beans for sowing, produce of Tanganyika. New schedule of grades.

Grading of Chillies (Amendment) Rules, 1951.—Change in weight of bags of capsicums. New schedule.

Native Land Coffee Rules, 1951.—Cancel and replace the African Grown Coffee Rules, 1949. Regulate the growing of coffee in native lands, with the object of maintaining good husbandry, and the purchase and manufacture of coffee under licence.

Coast Province Marketing Improvement and Inspection Rules, 1951.—After defining the terms used in the Rules, Part I (Marketing) lays down that no person shall buy produce except under licence; prescribes the powers of the licensing authority, and the conditions under which the licensed buyer shall operate. Part II (Improvement) proscribes the buying, selling, storing, etc., of wet produce or produce containing more than stated percentages of extraneous or defective matter. Part III (Inspection) provides for the inspection of all produce, proper marking, crating or bagging and the payment of fees. Part IV covers various minor provisions of a miscellaneous nature.

Grading of Maize for Local Purchase Rules, 1951.—After defining the terms used in the rules, methods of testing the grade of maize are laid down and the schedule of grades is given.

Wattle Bark (Improvement and Inspection) Rules, 1951.—Replace the 1937 Rules, embodying various amendments. A subsequent notice fixed the dates in the various areas during which stripping, and the purchase, sale and movement of bark and undergrade bark is permitted.

The Tea Rules, 1951.—After defining the terms used in the Rules, rule 3 prescribes the form of application for a tea licence; rules 4-7 cover tea export permits; rule 8 lays down that the manufactured tea cess shall be payable monthly and rule 9 that the acreage cess shall be payable annually both being accompanied by returns on the form set out in the schedule to the Rules.

Other legislation enacted during the year was as follows:—

Ordinances.—The Miraa Prohibition (Scheduled Areas) Ordinance; Sisal Industry (Amendment) Ordinances.

Rules and Regulations.—Crop Production and Livestock Ordinance; African Produce Improvement and Inspection (Amendment) Rules (Amendment to schedule; Bulrush millet included in the definition of native produce; Coast Province excluded from the Rules; maize excluded from provisions under section 9); the Samburu (Grazing Control) (Amendment) Rules. Customs Management Ordinance: Restriction of Tea Exports (Revocation) Order.

Emergency Laws.—Controlled Produce Regulations, 1943—amendment to schedule; prices for controlled produce—part I of the regulations, covering the buying and selling of controlled produce, extended to the Coast Province. Control of Export of Tea Revocation Order. Control of Tea Revocation Order. Control of Maize Regulations, 1944: prohibition of movement. European Agricultural Settlement Ordinance: Amendment to Regulations. Increased Production of Crops Ordinance: usual orders. Marketing of African Produce Ordinance: Licence Fees (Amendment) Rules; an amendment to schedule; declared area. Passion Fruit Ordinance: Amendment to Rules. Pig Industry Ordinance: Paddocking of Pigs rules. Plant Protection Ordinance: Dates between which the planting of maize and sorghum is prohibited. Tomato added to Import Control Order. Sisal Industry Ordinance: amendment to inspection rules (Unwashed sisal fibre not to be graded but sold by sample).

Staff

Mr. Stuart Gillett resigned the post of Director in May after 23 years in the Kenya Agricultural Department, on appointment to be Chairman of the Overseas Food Corporation, and Mr. G. M. Roddan returned from Nyasaland to become Director of Agriculture. Mr. R. J. M. Swynnerton, the new Assistant Director (Field Services), arrived in January. Mr. W. J. England was appointed to the vacant post of Principal, Egerton College of Agriculture. Mr. D. C. Edwards, Senior Pasture Research Officer, proceeded on leave pending retirement in May but was re-engaged on contract in December to undertake a pasture survey in the Northern Frontier Province. Mr. E. W. Gaddum, a Senior Agricultural Officer, who has been in charge of pyrethrum research, also retired during the year.

Messrs. F. B. Wilson and E. S. Porter left the strength, the former going as Professor of Agriculture, Makerere, the latter retiring through ill-health. Mr. E. Boswinkle was engaged to fill a vacancy as Agricultural Officer (Investigations). Otherwise no new Agricultural Officers arrived during the year, but Messrs. G. J. Gollop and T. Hughes-Rice were promoted to this rank, the former to be Provincial Agricultural Officer, Coast Province. Four probationers appointed by the Colonial Office were undergoing training. Successful recruitment in the United Kingdom by the Deputy Director while on leave filled many of the vacancies for Assistant Agricultural Officers, while it was possible to meet normal turnover by local recruitment.

There were still no Kenya Africans reading Agriculture at Makerere so that appointments to Assistant Agricultural Officers (African) were confined to promotions of outstanding Agricultural Instructors and Levellers. No difficulty was encountered in filling African vacancies in the Soil Conservation Service from candidates with secondary school qualifications or in the Instructors' Training Schools from pupils with the K.A.P.E. pass.

G. M. RODDAN,
Director of Agriculture.

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